THE ROYAL SCHOOL SERIES

Highroads of Geography

Illustrated by Masterpieces of the following artists :—
Sir H. von Herkomer, Joseph Farquharson, Leopold Rivers,
A. S. Tuke, T. M. Hemy, B. W. Leader, J. C. Hook,
H. Clarence Whaite, Sir J. C. Millais,
Sir Edwin Landseer, E. J. Poynter
&c., &c.

Book II.—Scouting at Home

THOMAS NELSON AND SONS
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BOOK II.

1. EYES AND NO EYES.

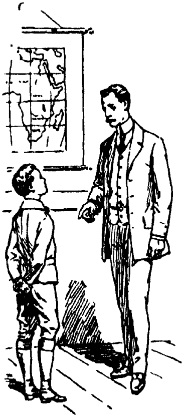
1. Dick Smith and I have set our hearts on being boy scouts. My big brother is a scout, and he has taught us how to tie the five kinds of knots, how to track a horse, and how to march at the scout's pace. We have also learned the scout law and the scout signs, and can show how the Union Jack is built up.

2. A few weeks ago we went to the scoutmaster and asked him to let us join. He was very kind, but he shook his head. "You are under ten years of age," he said. "So many boys wish to join that I have to say 'no' to all who are under ten."

3. Dick and I begged very hard to be allowed to join, but all in vain. We were very miserable. We shall not be ten for many long months. Fancy having to wait all that time!

4. One day I told our teacher about it. He said,

"Don't worry, my boy. I'll tell you what we'll do. All the boys and girls in my class shall be scouts. This year we'll learn our geography by scouting.



5. "We will go scouting in our own parish. I am sure that you will like it. You will not only learn your geography in the best way, but you will be better scouts when you are old enough to join."

6. Of course, we were delighted, and we were all eager for the scouting to begin. One morning teacher said, "You shall have your first lesson to-morrow afternoon."

7. The next afternoon not a single boy or girl was absent. Even Tom Thompson, the truant, was present. He is the gamekeeper's son, and is often deep in the woods when he ought to be at school. He told me that he hoped there was going to be plenty of scouting in the lessons, and not much geography. He said he was very fond of scouting, but he hated geography.

8. Teacher began the lesson by placing a large coloured picture before us. "Look carefully at this," he said, "for just *one* minute. When the time is up I shall take the picture away and ask you some questions about it."

9. We all stared hard at the picture. When teacher had taken it away, he asked, "What has the man on

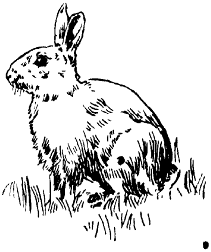
his feet?" I tried hard to remember, but I couldn't; so I guessed, and said, "Sandals." Another boy said, "Top-boots;" and a girl said, "Slippers."

10. There were many other answers, but all were wrong. At last teacher pointed to Tom Thompson, who said, "The man has nothing on his feet at all."

Then teacher showed us the picture again, and Tom was quite right. I felt very foolish.

11. "You see," said teacher, "you have eyes and no eyes. You have not learnt to observe. A scout who cannot use his eyes well is of no use at all. You must train yourselves to notice even the smallest things.

12. "When you go for a walk, I want you to use your eyes, and to notice and remember all that you see. Look at the marks on the road, and find out whether they have been made by carts, motors, bicycles, or horses.



13. "Notice the trees and the birds. Look out for a rabbit in the field or a water-rat in the brook. Try not to miss anything. In this way you will train your eyes, and you will find your walks much more pleasant and useful than they are now."

2. MAKING A COMPASS CARD.

1. "Before we begin our scouting," said teacher, "there are certain things which we must learn. First, we must know the points of the compass, and be able to point them out for ourselves.

2. "Last year you learnt something about the mariner's compass. You were told that it is a magnet, one end of which points towards the north, and the other end towards the south.

3. "Here is my pocket compass. Under the needle there is a card showing the eight chief points of the compass. There are thirty-two points altogether, but this card is too small to show them.

4. "You know that in the ship's compass the needles cannot be seen at all. There are really three or more needles, but they are fixed *under* the card in such a way that the N. on the card points to the true north, the S. to the true south, the E. to the true east, and the W. to the true west.

5. "I wish I could give each of you a compass; but as I cannot do so, you shall have the next best thing, and that is a compass card."

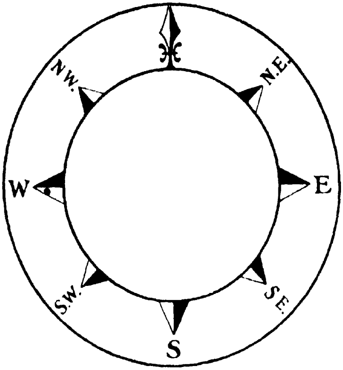
6. Teacher then gave each of us a piece of paper and a piece of card, both of them cut in the shape of a ring. We folded the paper into two, then into four, and last of all into eight.

7. When we opened out the paper there were eight

creases on it. We drew a pencil line along each of the creases, and thus the ring of paper was divided into eight parts.

8. At the end of one of the pencil lines we drew an arrow-head, and put the letter N. by it. At the other end of the same line we put the letter S. On the left side of the line, midway between N. and S., we put the letter W., and at the other end of the same line we put the letter E.

9. Then at the end of the line midway between N. and W. we put the letters N.W., and at the other end of the same line S.E. At the end of the line between N. and E. we wrote N.E., and at the other end of the same line S.W. When we had gummed the ring of paper on the ring of card our compass cards were complete.



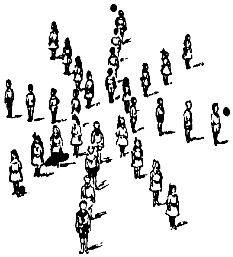
10. "Now," said teacher, "we will go out to the playground and see what use we can make of our compass cards in scouting." We marched out and stood in a line, our compass cards lying in the palm of the left hand.

11. "Look towards the church tower," said teacher. "You are now looking north. Turn your cards so that the arrow head points to the church tower." We

did so; then teacher asked us to tell him in which direction the Manor House lay. I was the first to reply, "It lies to the east of us." Then we found that the railway station lay to the west and Fern Hill to the south of us.

12. When we had noticed the position of these and many other places, teacher told us to put our cards in our pockets. Then he called us out one by one, and made us march north or south, or east or west, until we made no mistakes.

13. Just before we returned to school he let us make a living compass card. Eight of us formed the north and south line, eight the east and west line, eight others the north-west and south-east line, and the last eight the north-east and south-west line. It was a first-rate game, and we enjoyed it very much.



14. Teacher let us break off and play about a little. Suddenly he blew his whistle and said, "Form the points of the compass about me." We ran to our places, and before you could count ten we had formed the living compass card once more.

3. OUR FIRST WALK.

1. "This afternoon," said teacher, "we are going to take a 'direction walk.' Each of you will bring a notebook, a lead pencil, and your compass card."

We were quite excited when we heard this. None of us knew what teacher meant by a "direction walk."

2. In the afternoon he formed us up in the playground, and made us march steadily to and fro between marks which he had made on the ground. He held his watch in his hand, and he said that he was finding out the rate at which we walked. I heard him say that we walked about eighty yards a minute.

3. After a time he marched us across the road into the big field on the other side. The farmer who owned the field had said that we might do our scouting in it if we took care not to damage the fences or the trees.

4. Teacher formed us up with our backs to the gate. "We shall first march towards that big elm," he said. "Set your compass cards to the north, and find out the direction in which we are to walk."

We soon found out that the elm lay to the north-east of us.

5. Then he chose Tom Thompson, and said, "Tom

will march steadily in a straight line to the elm. Quick march!" Off tramped Tom. Teacher held his watch in his hand, and when Tom reached the elm he cried out, "Halt! Notebooks out! Write down, 'Walked one minute, north-east.'"

6. We all marched off to the elm, and teacher chose a girl to walk the next part of the journey.

"Kate will march to the top gate," said he. "Find out the direction." We set our compass cards again, and found that the gate lay to the north-west of us.

7. At the word of command Kate marched off and halted at the gate. Then teacher told us to write in our notebooks, "Walked two minutes, north-west."

8. We all moved on to the gate, and teacher chose Dick Smith to walk due south. We fixed the direction by means of our compass cards, and Dick walked on until teacher called out "Halt." Then we wrote in our notebooks, "Walked south, one minute."

9. Then Mary Smith walked due west for half a minute, Joe Black walked south-east for a minute, and Ellen Jones walked east for half a minute. After this I walked south for a minute, and found myself at our starting-point.

10. When we all reached the gate, teacher said,

"We will now go back to school and 'plot out our walk.'" In a few minutes we were again seated at our desks. Drawing-books and rulers were given out, and we were quite ready to "plot out our walk," whatever that might mean.

11. "Now," said teacher, "we are going to make a drawing which will show us not only the directions in which we walked, but the distance which we walked in each direction."

12. "O teacher," I cried, "the paper isn't big enough for that."

"How big should it be?" he asked.

"As big as the field," I replied.

13. The boys laughed; and I blushed, because I knew that I had made a mistake. Of course, you couldn't get a piece of paper as big as a field; and if you could, it would be too clumsy to use.

14. "Well," said teacher, "what shall we do?"

The question was a puzzler. No one in the class could answer it.

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4. ALICE IN WONDERLAND.

1 Teacher smiled as he looked at our blank faces. "I see that I must help you," he said. "Hands up, those who have read 'Alice in Wonderland.'" Several of us held up our hands.

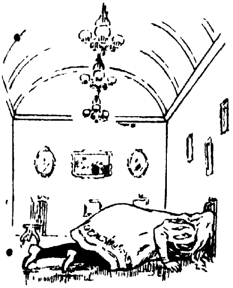
2. Teacher opened his desk and took out a copy of "Alice in Wonderland." Then he began to read as follows: "Alice opened the door, and found that it led into a small passage not much larger than a rat-hole.

3. "She knelt down and looked along the passage into the loveliest garden you ever saw. How she longed to get out of that dark hall and wander about among those beds of bright flowers and those cool fountains!

4. "But she could not even get her head through the doorway. 'And even if my head would go through,' thought poor Alice, 'it would be very little use without my shoulders. Oh, how I wish I could shut up like a telescope!'

5. "She went back to the table, and this time she found a little bottle on it. Tied round the neck of the bottle was a paper label, with the words 'DRINK ME' beautifully printed on it in large letters."

6. "I won't read any more," said teacher, "but I will tell you the rest. Alice drank out of the bottle, and at once she began to shrink. She shrank and shrank until she was only ten inches high. Then she was small enough to go through the rat-hole into the garden.



7. “Now when Alice shrank, she shrank in every part. Her head, her body, her limbs all grew smaller and smaller at the same time. When she had finished shrinking, she was a perfect little Alice—a small copy of the bigger Alice that her friends knew.

8. “Now let us suppose that Alice was fifty inches high before she drank out of the bottle. She had now shrunk to ten inches —that is, she was only one-fifth of her former height. Every part of her had shrunk to one-fifth. Her arms and legs, her fingers and toes, were only one-fifth of their former length, and her body was only one-fifth of its former thickness.

9. “Suppose I take a sheet of paper and on it draw a picture the exact size of Alice after she had drunk out of the bottle. Could you find out from this picture the height and breadth of the real Alice?”

10. “Oh yes,” we replied. “We should just measure her height and breadth on the paper and multiply them by five, and then we should know her real height and breadth.”

“Why multiply by five?” asked teacher.

Nearly all of us knew. “Because you

told us that she had shrunk to one-fifth of her former size."

11. "Now," said teacher, "suppose we make our walk shrink until we can get it on to a small sheet of paper. You first walked one minute to the north-east. Let us make a minute's walk—that is, eighty yards—shrink down to a line one inch long.

12. "Half a minute's walk will shrink to—"

"Half an inch," we cried.

"And a two minutes' walk will shrink to—"

"Two inches."

13. "Very good," said teacher. "I think you begin to understand that we can make a drawing on a small piece of paper which will show us not only the directions in which we walked, but the distances as well."

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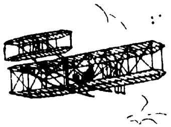
5. PLOTTING OUT THE WALK.

1. "In the middle of your paper put a dot (A) to stand for our starting-point. Place your compass card so that the dot appears in the hole in the middle of the card. Set the card so that the N. on it points straight to the top of the page.

2. "What did you write first in your notebooks?"

We read as follows: "Walked one minute, north-east."

Put a dot at the end of the line N.E. to mark the *from above.* Suppose we had taken this walk over a field of untrodden snow, a man in an aeroplane looking down on the field would see that our footprints made a large figure of just the same shape as the small figure in your books.



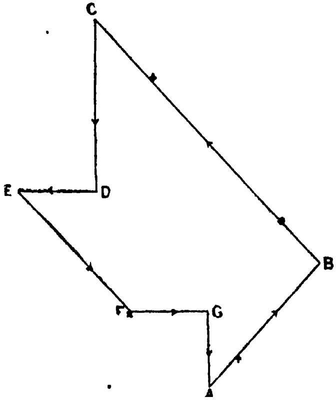
7. "Suppose I handed this plan to a stranger and told him that it showed our walk of this morning. Do you think he could tell us all about it?" We all agreed that he could.

8. "I think you scouts now begin to understand the use of a plan such as this. Suppose your captain sent you to find the best way for soldiers to march to a certain place. The first thing you would have to do would be to get or to make a plan of the journey. This you would hand to your captain, so that he could guide his men. A scout who cannot make a plan of his journey is not of much use.

9. "Now I am going to set you a real scouting exercise. Somewhere on our line of march I have dropped three brass buttons. Let me see who will be the first to find them, and to mark down on the plan the places where they were picked up."

6. THE HUNT FOR HIDDEN TREASURE.

1. Tom Thompson and his chum, Willie Winter, found the buttons. I am sure I need not tell you how they did it; but perhaps you would like to see their plan. The crosses show where the buttons were found.



2. Teacher then gave us another exercise, which he called "The Hunt for Hidden Treasure." I am going to tell you about it, so that you can try it for yourselves.

3. Teacher gave us the following directions:—*The treasure is hidden in Farmer Smart's ten-acre field. Begin to search at the old oak. Walk one and a half minutes from the oak towards the sunset, then half a minute towards the Pole Star. Look towards the sunrise, and you will see a white stone. Make your way to this stone, and walk towards the church tower. Underneath the hedge which lies in your path you will find the treasure.*

4. I am glad to say that I was the first to find the treasure. I was much surprised when I saw what it was. I thought it would be gold, at the very least, but it was only a lead pencil after all.

5. Next time we had a geography lesson teacher called us out one by one and let us make plans of an ink-bottle, a box, a tea-caddy, and several other things. It was very simple. We placed the things on the table and ran a chalk line round their shape. The figures which we thus made were plans.

6. When teacher told us to draw the plan of our classroom on the table, we saw at once that this way would not do. One of the girls said, "We shall have to make the plan much smaller than the real thing. We shall have to shrink the schoolroom a great deal to get it on the table."

7. "Quite right," said teacher; "but first tell me the shape of the classroom."

"It is an oblong," we cried.

"So it is," said teacher; "we will now measure."

With a tape measure he found that the room was 40 feet long and 20 feet broad.

8. "How much shall we shrink the classroom?"

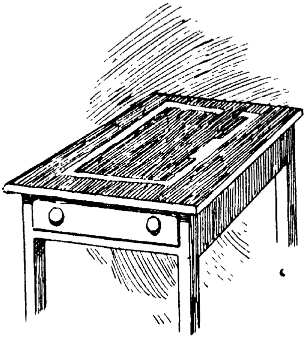
A boy thought we ought to shrink it to one-fifth, just as Alice was shrunk.

"One-fifth will not do," said teacher. "My table is only 4½ feet long and 3 feet broad. One-fifth of 40 feet is 8 feet, and one-fifth of 20 feet is 4 feet. I cannot get a figure 8 feet by 4 feet on a table that is only 4½ feet by 3 feet."

9. "Shrink it to one-tenth," said Tom Thompson. "One-tenth of 40 feet is 4 feet, and one-tenth of 20

feet is 2 feet. You can make the plan 4 feet long and 2 feet broad."

"Capital!" cried teacher. He drew an oblong on the table 4 feet long and 2 feet broad. "Here is a plan of our classroom.



10. "Now, suppose I took this plan to the boys and girls in the first class, and told them that it shows our classroom. Could they find the real size of the classroom from it?"

"No," I replied; "not unless they knew how much it was shrunk."

11. Teacher then wrote under the plan: "*This plan is one-tenth of the real size—that is, every foot of the classroom is shown by one-tenth of a foot on this plan.*"

12. "Could they find the real size now?"

"Oh yes," we said, "quite easily. They would only have to multiply the length and breadth of the plan by ten, and the answer would give them the real size of the classroom at once."

13. "You see," said teacher, "it does not matter how small or how large you make the plan, so long as you tell people how much bigger or smaller it is than the real thing."

7. PLANS AND MAPS.

1. Teacher now unrolled the large plan * which the builder of the school had made. It was beautifully drawn and coloured, and it showed the size and shape not only of the school, but of the classrooms, the doors and windows, and the passages.

2. Underneath the plan we saw what teacher called the *Scale.* It was simply a line marked off into equal lengths. Each of these lengths stood for ten feet on the plan. The first length, we noticed, was divided into ten parts, so that we could measure odd feet if we wished to do so.

3. Teacher let some of us measure the length and breadth of the doors and windows as shown on the plan, while others measured the length and breadth of the real doors and windows. The plan was right every time. Teacher also made us come out in turn and show him on the plan our seats in class, and the places where the easel, the piano, and the cupboard stood.

4. "You have all seen a watchmaker at work," said he. "No doubt you have noticed that he holds a glass to his eye while he is looking at the works of a watch. He does this because the works are so small that he cannot see them well with the naked eye. The glass makes the works appear larger than they really are, and thus he is able to see what is wrong with them.

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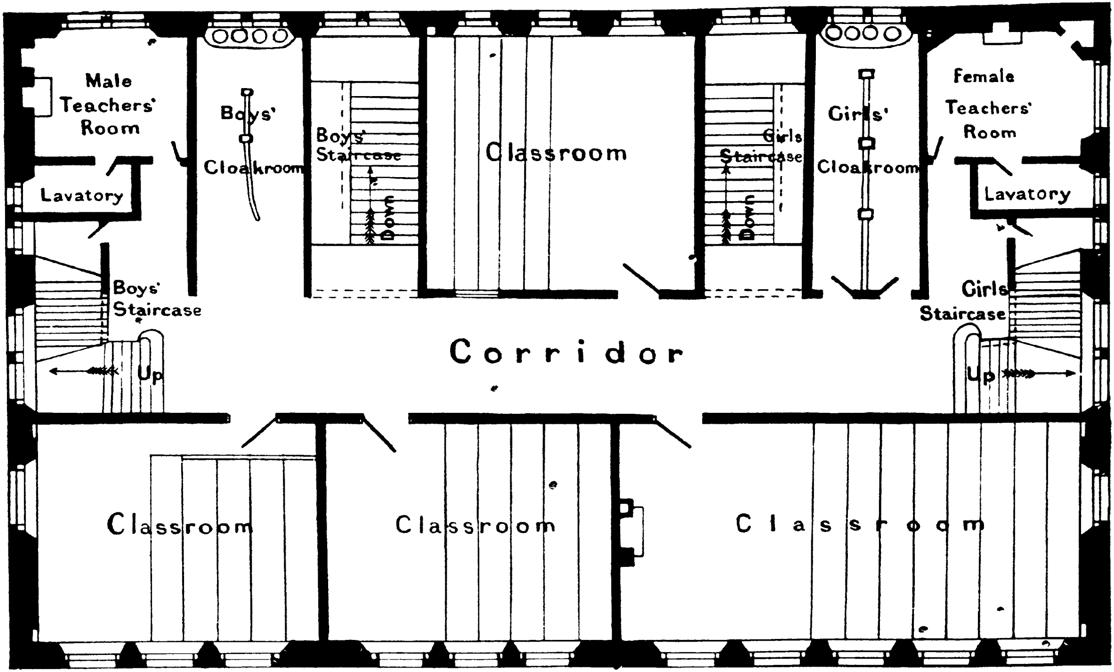
* See page 26.



THE BUILDER'S PLAN OF THE SCHOOL.

5. "You can easily understand that if we are to make a plan of the works of a watch, it will have to be larger than the real thing. If it is the same size or smaller it will not be useful. When we make plans of very small things, we usually make them larger than the things really are.

6. "On the other hand, if plans are to be made of very large things, we must make them much smaller than the things really are. If, for instance, you wish to make the plan of a country, you must make it very much smaller than the country really is.

7. "Suppose you wish to make a plan of England and Wales. The distance from the north to the south of England is 360 miles. Here is a plan of England and Wales which is only ten inches long. Every inch on this plan must, therefore, stand for 36 miles—that is, a man on a bicycle would take about three hours to travel one inch on the plan.

8. "Here is another plan. It shows us the whole of the great land mass known as Europe. From the north to the south of Europe is a distance of 2,400 miles. This plan measures only 8 inches, so every inch on the plan stands for 300 miles—that is, a man on a bicycle would take about twenty-five hours to travel one inch.

9. "I have here a book of plans. I will show you some of them."

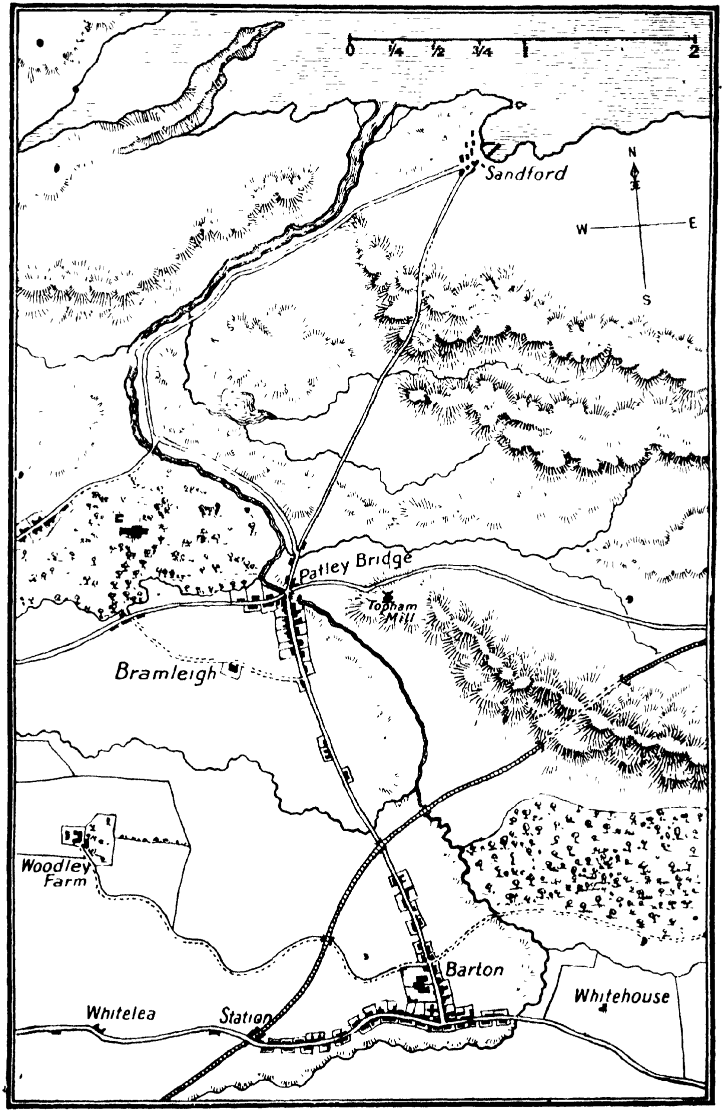
Teacher opened the book in his hand and showed us the plans. As soon as we saw them we said, "Please, teacher, they are maps!"

10. "So they are," he replied. "A map is a plan, and a plan is a map. They are one and the same thing though they have different names. We speak of a *plan* when the drawing shows us a house or a farm, a village or a town. When the plan shows a country or a part of a country, we call it a *map*. If it shows part of the sea, we call it a *chart*."

8. GAMES WITH MAPS.—I.

1. "No scout is worth his salt," said teacher, "if he cannot read a map as easily as a book. Give a good scout a map, and he will very soon know a great deal about the country which it shows. Indeed, he will know more about it than he would if he had travelled over it. I am now going to show you what we call the map signs."

2. He then told us that the part of a map coloured blue shows water, either the ocean, a sea, or a lake. The wavy line next to the blue shows the *coast*—that is, the land on the edge of the sea. A wavy line on the land shows a river, and a thing like a caterpillar stands for hills or mountains. A town or a village is marked by a small black square or a dot.


0
1/4
1/2
3/4
1
2
N
W
E
S
Sandford
Patley Bridge
Topham Mill
Bramleigh
Woodley Farm
Barton
Whitehouse
Whitelea
Station

Four=footed Scouts.

(*From the picture by Sir Edwin Landseer, R.A.*)

[This picture represents a scene which was formerly common on the St. Bernard Pass. By means of this pass, which is about one and a half miles above sea-level, travellers cross the Alps from Italy to Switzerland.]

Let those who think they have the longest walk to school hold up their hands."

Tom Thompson and a girl named Kate Slater held up their hands.

9. "Well," said teacher, "let us measure. Kate Slater lives at Whitelea, and Tom Thompson lives in the gamekeeper's cottage at Bramleigh. With your straight-edges find out how far Tom and Kate have to walk to school.

I found that Kate had to walk 2¼ miles, while Tom had only to walk 2 miles.

10. "Which of them is the oftener late?" asked teacher; and we all laughed. Kate Slater is never absent and never late. No matter how bad the weather is, you are sure to find her in the playground before the bell begins to ring. As for Tom Thompson, he is often absent and often late, though he has improved a good deal since we began scouting.

9. GAMES WITH MAPS.—II.

1. We are all beginning to understand a map now, and we are surprised to find out how much we can learn from it. Teacher often gives us questions on the map of our district.

2. Here are some of the questions which we can now answer quite easily:—

"What place do you reach if you walk one mile straight on from the east window of the church? In what direction and how far from school is Topham Mill? Walk along the highroad from Whitehouse to the station. How far and in what direction do you walk?"

3. Let me give you a real scouting problem which teacher set us. You are supposed to be scout to an army which lands at Sandford, and you are sent forward to find the easiest and quickest way by which the big guns can reach the village of Barton. What report should you make to your general?

I am not going to give you the answer to this question, because I think you would like to work it out for yourselves.

4. "With your straight-edges," said teacher, when we began our next lesson, "you have been measuring distance 'as the crow flies.'—Tom Thompson, how does the crow fly?"

"Straight on, sir," he replied.

5. "Yes," said teacher: "a crow does not turn out of his way for hedges, or houses, or hills, or rivers, but flies in a straight line from one point to another. In America people call this a bee-line. Very few of our roads follow a bee-line; most of them twist and turn about a good deal.

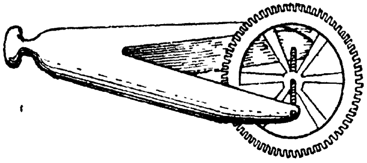
6. "I wonder who has the longer walk to school—Jane Barker, who lives at Woodley Farm, or Mary Smith, who lives at Patley Bridge. We will see how far they have to walk 'as the crow flies.'" We soon saw that Jane had not so far to walk as Mary.

7. "I don't think that can be right," said Jane. "I can walk just as fast as Mary, but it always takes me longer to get to school."

8. Teacher said that Jane was quite right. "Mary," said he, "walks along the highroad, which is almost a bee-line, while Jane has to walk along lanes which twist about a great deal. If Jane's road were straightened out, it would be much longer than Mary's."

9. He took a little cogged wheel out of his desk and fitted it into a handle. Then he ran the cogged wheel along a line on the board to show us how it worked.

10. "We use this cogged wheel," he said, "to measure wavy lines on a map. This little wheel turns round once in two inches. See, I run my little wheel along this line on the map. If I stop when the wheel has turned round once, I know that the distance which it has travelled is two miles.



11. "Now let us measure this river. See, I run the wheel along the wavy line, twisting it about to follow the windings of the river. I notice how many times the wheel turns round. Up to the present I have counted six turns, and now I must make a half-turn more to get to the end of the river. Who can tell me how long the river is?"

12. I said to myself, "Every turn of the wheel measures 2 miles on the map, therefore six turns of the wheel will measure 6 times 2 miles—that is, 12 miles. If I add 1 mile for the half-turn, the answer ought to be 13 miles."

I was quite right, and so were several other children.

13. Teacher then measured a long winding road shown on the map, and a piece of the coast line, which is always more or less wavy. He told us that men who use maps a great deal always have a cogged wheel to help them.

10. A WEATHER FORECAST.

1. "Scouts," said teacher, "ought to be good weather-prophets. A scout ought to be as keen to notice the clouds and the wind as he is to see the marks on a road. A change of weather may make a great difference to his plans, and also to those of an army.

2. "Let me give you an example. During the great war with Napoleon, the British general, Wellington, had arranged to meet the Prussians at Waterloo, and there to fight a battle with the French. Wellington and his men were on the field early; but the Prussians were very late.

3. "All the day before, rain had fallen heavily, and the roads by which the Prussians were making their way to the battlefield were very soft and miry. The wheels of the big guns sank in the ground, and sometimes they could scarcely be moved at all. This meant that much time was lost on the road.

4. "All day long Wellington's men had to fight the French without the help of the Prussians. In the evening the Prussians marched on to the field, and the French were forced to flee.

5. "The Prussians did not arrive a moment too soon. Had they been another hour on the road the French might not have been beaten, and the history of Europe might have been greatly changed.

6. "Everybody has to think about the weather. So often does it change in our country that when people meet they almost always talk about it. Farmers and sailors, fishermen and miners must pay great heed to the weather.

7. "Every day in our newspapers we read what is called a weather forecast—that is, a statement of what weather we are likely to have during the next twenty-four or forty-eight hours.

8. "Most countries now have men in all parts of the land to watch the weather, and to send news about it to an office in the chief town. In this office the news from all parts is studied by skilful men, who are then able to say what weather we are likely to have for some time to come.

9. "What news do these weather-watchers send? Well, first of all they say how hot or how cold the air is at the place where they are watching. They also say whether the air is light or heavy, in which direction the wind is blowing, and how strong it is. They also say how much rain has fallen during the day.

10. "Now let us be weather-watchers. I will tell you how weather-watching is done. First, we must be able to find out the heat of the air.

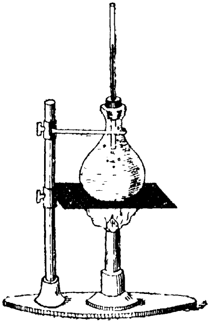
11. "Here is a flask with a long tube thrust through the cork. The flask is filled with coloured water. I light this lamp and place it under the flask. Notice what happens."

In a minute or so we cried, "The water is rising in the tube."

12. "Yes," said teacher. "I have been heating this water, and it now takes up more space than it did when it was cool. The more heat I put into the

water the more it will expand, until it boils. Then it will turn into steam.

13. "Now I take away the lamp, and you notice that the water begins to sink in the tube. It is now getting cooler, and is taking up less space than it did before. If I were to make the water colder and colder still, it would shrink, or contract, until it could contract no more. Then it would become a solid lump of ice.

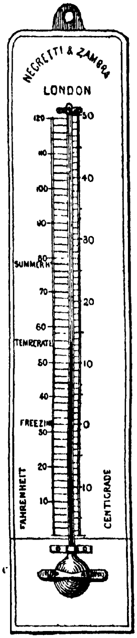


14. "If we had a long tube and a very little flask of water at the end of it, we could use the tube and flask to find out, in a rough sort of way, the heat of the air.

15. "We could make a mark where the water stood in the tube, and then notice, as time went on, whether the water rose or sank. If it rose, we should know that the air round the flask had grown warmer; if it sank, we should know that the air had become colder. In the next lesson I shall tell you about the heat-measurer which weather-watchers use."

11. THE HEAT-MEASURER.

1. "Here is the heat-measurer which weather-watchers use. It is called a *thermometer.* You see that it is a long and very narrow tube, with a bulb at the end. Inside the bulb and tube there is a silvery liquid called mercury.



2. "Look! I hold the bulb in my hand. The heat of my hand makes the mercury expand and rise up in the tube. Now I take away my hand and put the bulb into cold water. Down the mercury sinks below its former level.

3. "All along the tube you see little marks by means of which we are able to measure the heat shown by the thermometer. The space between two of these marks is called a *degree*—that is, a step.

4. "One mark on the tube is called *freezing point.* On some tubes we find another mark high above freezing point. This is called *boiling point.* On a cold winter's day the mercury sinks to freezing point, and sometimes much lower.

5. "On a hot summer's day in our country the mercury stands high above freezing point, but it never reaches boiling point. To make it reach boiling point, we must put the bulb in boiling water.

At Freezing Point.

(From the painting by Joseph Farquharson, A.R.A., in the National Gallery of British Art.)

6. "On a very cold day in this country the mercury has been known to fall thirty-five degrees below freezing point. On a very hot day it has been known to rise two-thirds of the distance between freezing point and boiling point.

7. "Weather-watchers look at the thermometer two or three times a day, and notice the degree of heat shown by the mercury. This they send to the office where the weather forecast is made up.

8. "Ours is a cool country, where the air is never very cold and never very hot. Round the North and South Poles the air is so cold that the mercury freezes. Men who travel in these very cold lands are obliged to carry thermometers in which there is a kind of spirit which will stand great cold without freezing.

9. "Midway between the North and South Poles the air becomes very hot indeed. In the middle of Africa, in India, and in many other places the thermometer rises to a great height. In parts of India the heat is so great during summer that white men cannot bear it.

10. "Last year you learnt that the heat of the sun turns some of the water on the earth into vapour, which rises up and forms clouds. When these clouds are chilled they are turned back into water, which falls as rain.

11. "Hot air can hold more water-vapour than cold air. If the air is hot, much water-vapour

rises from the sea; if the air is cold, less water-vapour rises. *The amount of water-vapour which rises into the air depends on the degree of heat.*

12. "In the parts of the earth where the air is very hot there is far more water than land. Look at a globe, and you will see that this is so. The air of these hot parts of the world is able to hold a vast amount of water-vapour.

13. "The heat of the sun warms the ground and the sea, which then heat the air above them. You learnt last year that hot air rises and that cold air sinks. When this takes place the air is set in motion, and this causes a wind to blow. It is this wind which drives the clouds along until they are chilled and fall as rain.

14. "Now I think you begin to understand that wind and rain both depend upon the heat of the air. You see now why weather-watchers notice the changes in the degree of heat as shown by the thermometer.

15. "You cannot foretell the weather by knowing only the degree of heat; you must know other things as well. The degree of heat, however, is one of the things which weather-prophets *must* know."

AT THE TOP OF THE HILL.

12. AT THE TOP OF THE HILL.

1. "Who has been right to the top of Fern Hill?" asked teacher.

Most of us put up our hands.

"Well, what is the state of the ground at the top?"

2. I didn't remember anything special about the ground at the top of the hill; but Willie Winter did. He said, "The rocks stick out of the ground, and bits of them are lying about, just as if somebody had upset cart-loads of road-metal there."

Willie's father is a quarryman, so I suppose that is why he noticed the rocks at the top of the hill.

3. "Nobody has taken loads of road-metal to the top of Fern Hill," said teacher. "The stones which are lying there are broken bits of the rocks. Now I wonder what it was that broke up the rocks."

None of us could tell.

4. "You all know that heat makes liquids expand. It also expands solids. If you make a poker hot, it becomes a trifle longer and a trifle thicker. Almost all things grow larger when they are heated.

5. "When the sun shines on the rocks their surface expands. At night, when the sun has gone down, the surface contracts. In time this expanding and contracting split pieces off the face of the rocks.

CRAG-CLIMBING IN THE ENGLISH LAKE DISTRICT

(*Photo by Abraham.*)

6. "Last year you learnt something about the great desert of North Africa. You know that in the daytime the heat of the sun on the Sahara is so great that the rocks become too hot to touch. At night they are greatly chilled. Because of this heating and cooling the rocks soon split and crack, and break down into sand.

7. "Dick Smith's father is a plumber. Perhaps he will tell us at what time of the year his father is busiest."

Dick smiled.

"When the thaw comes, sir, and bursts the water-pipes."

8. "I didn't expect you to make that mistake," said teacher. "It is not the thaw but the frost that bursts the water-pipes. While the frost lasts, and there is ice in the pipes, we do not know that they are burst. It is only when the thaw comes and the water begins to flow in them that we know there is a leak.

9. "I told you that water contracts when it becomes cold—that is, when some of its heat is taken away. Suppose I made the water in this flask colder and colder, what would happen? It would keep on contracting till it could contract no longer; then suddenly it would expand and become ice.

10. "When the water suddenly expands and turns into ice, it does so with great force. I once read of

a soldier in Canada who filled a cannon ball full of water, and then plugged up the hole with an iron bolt. He put the cannon ball outside in the bitter cold of a winter's night. In the morning he found that the ice had made a great crack in the thick iron shell.

11. "During the winter rain-water runs into the cracks of the rocks on Fern Hill. When the frost comes and the water turns into ice, it forces the sides of the cracks apart, just as though a number of wedges had been driven into them. This causes parts of the rocks to split off.

12. "Look at the picture on page 44. It shows you the top of a Welsh mountain. The stones which you see lying about have been split off the rocks by the force of freezing water.

13. "If you visit a hilly district, you are sure to notice that the weather has cracked and split and worn the rocks into all sorts of quaint shapes. I know a hill in the Lake District of England where one of the rocks looks like a cobbler bending over his last. Another rock not far away is shaped like a lamb lying down by the side of a lion.

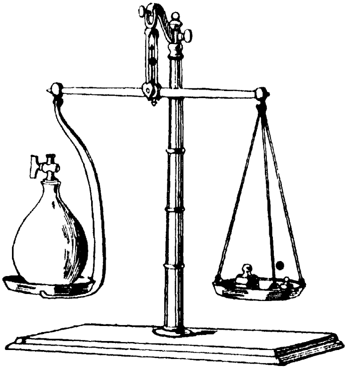
14. "Elsewhere in the same district there are tall crags sticking up from the sides of the mountains like towers. To climb these crags is a favourite sport of many men and women. Look at the picture on page 46, and notice how the climbing is done. You can easily see that it is a very dangerous sport."

13. WEIGHING THE AIR.—I.

1. "Perhaps you will be surprised to learn that the air has weight. In olden times men thought that the air had no weight, but we now know that they were quite wrong.

2. "Air has weight, though it is very much lighter than such things as iron, coal, or water. A box full of water weighs a thousand times more than the same box full of air.

3. "You know that we live at the bottom of an ocean of air. It is all round us on every side, and it stretches above us to a height of about forty-five miles. Though air is far lighter than iron or coal or water, you can easily understand that this vast amount of air must be very heavy indeed.

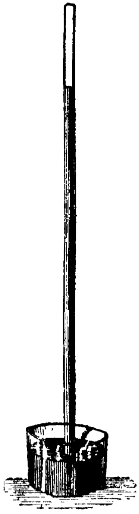


4. "It is said that all the air above the earth weighs more than five thousand millions of tons. You can have no idea what this means; you only know that it is a very great weight indeed.

5. "Now, how can we weigh the air? We can weigh it just as we weigh other things—by means of a pair of scales. Here is a bottle with a closed stop-

cock at the mouth. Nearly all the air has been drawn out of it. I place it on one of the pans of a very fine pair of scales, and put weights in the other pan until both sides balance.

6. "Now I open the stopcock, and the air rushes in and fills the bottle. At once you notice that the pan on which the bottle is placed sinks and no longer balances the other pan. This means that the bottle is heavier than it was before. It is heavier now because of the air which fills it. From this you learn not only that air has weight, but how much this bottleful of air weighs.



7. "Here is a tube about three feet long, stopped up at one end and open at the other. I fill it full of the heavy liquid known as mercury until it brims over. I also shake it to drive out any air bubbles that may be in it.

8. "Now I put my thumb over the open end and dip it into this bowl of mercury. If I hold the tube upright, and then take away my thumb, what will happen?"

9. We all thought that the mercury in the tube would run out into the bowl. Strange to say, however, only a small part of it ran out! The rest stopped in the tube.

10. "What is holding up the mercury?" asked teacher.

Stormy Weather.

(From the picture by Leopold Rivers in the National Gallery of British Art.)

None of us could tell.

"The weight of the air," said teacher. "The air presses so heavily on the mercury in the bowl that it holds up the mercury in the tube.

11. "So heavy is the air down here that it presses on every square inch with a weight of nearly fifteen pounds. I want you to remember that the weight of the air at sea-level will hold up a tube of mercury about thirty inches high.

12. "On this tube I make a mark to show the height of the mercury at this moment. If anything happens to make the air weigh heavier, the mercury will be pushed up higher. If, on the other hand, anything happens to make the air weigh less than it did before, the mercury will fall. This tube of mercury, then, tells us the weight of the air. It is called the *barometer*."

◆

14. WEIGHING THE AIR.—II.

1. "If you watch the barometer carefully, you will notice that the mercury rises and falls from hour to hour and from day to day. It is never at the same point for very long.

2. "You must not suppose that the mercury rises or falls very much. It has never risen to thirty-two inches, and it has never fallen below twenty-seven

it. As this air rises, there is less and less air above it to press it together. It therefore expands.

9. "You already know that when air expands it becomes cold. Now cold air cannot hold so much water-vapour as hot air. Some of the water-vapour must, therefore, be given up. It falls as rain.

10. "When air sinks down it becomes more and more pressed together by the weight of the air above it. When this happens the air grows hotter and hotter. This means that it can hold more water-vapour than it did before. When the air is falling at a place, we usually find the sky clear and the weather dry.

11. "Now you understand why weather-watchers carefully notice the barometer. If the mercury stands high, the air is falling, and this means fair weather; if it stands low, the air is rising, and rain may be expected.

12. "If the mercury is fairly steady, the weather will very likely remain much the same; if it is unsteady, there will be changes in the weather.

13. "When the mercury rises quickly, the weather is likely to be unsettled; when it rises slowly and steadily, we shall have settled weather. A quick fall gives warning of wind with rain.

14. "Here is a little rhyme which you ought to know,—

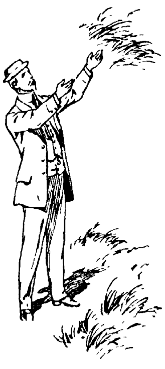
'Long foretold, long last;
Short notice, soon past.'"

15. HOW'S THE WIND?

1. "You now know," said teacher, "how weather-watchers find out the heat and the weight of the air. There is something else which they must notice. They must watch the wind and find out not only the way in which it blows but how strongly it blows.

2. "How's the wind to-day?"

"South-west," said Tom Thompson. Teacher asked him how he knew. Tom said that he had noticed which way the smoke of their chimney was blowing that morning.



3. "Is there any other way of finding out?" asked teacher.

Tom thought a moment and replied: "Father sometimes throws up bits of dry grass, and watches the direction in which they are blown along. Sometimes he wets his thumb in his mouth and holds it up. The cold side of his thumb tells him the direction in which the wind is blowing."

4. "Is there a simpler way?" asked teacher.

"Yes, sir," I said. "Just look at the weathercock."

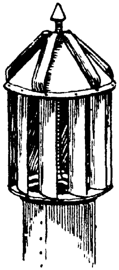
Teacher made me tell him all about it.

5. "Now," said teacher, "we know how to find out the direction of the wind. Weather-watchers can tell beforehand the direction in which the wind is likely to blow. They draw lines on a map through all the

places where the barometer stands at the same level. Then they know that the wind will blow from the lines where the barometer is high towards the lines where it is lower.

6. "Now we must find out the force of the wind —that is, the speed at which it blows. Here is a chimney cowl that is blown round and round by the wind. I am sure you have seen a cowl like this on the top of a chimney.

7. "Some days it scarcely moves at all; at other times it whizzes round and round very quickly indeed. By watching a chimney cowl of this kind we obtain some idea of the force of the wind from day to day.



8. "Everybody knows that the wind blows more strongly on some days than it does on other days. If it blows 13 miles an hour, we say there is a *light breeze;* if it blows 28 miles an hour, we call it a *fresh breeze.* When it hurries along at 56 miles an hour, we say it blows a *gale;* and when it has a speed of 90 miles an hour, a *hurricane* is blowing.

9. "When the wind blows more than forty miles an hour, we say that a storm rages. Every winter storms blow over our islands, and sometimes they do much mischief.

10. "Many of our storms are short and sudden bursts of wind lasting a few hours, but the 'Great Storm,'

AFTER THE STORM.

(*From the picture by C. Napier Hemy, A.R.A.*)

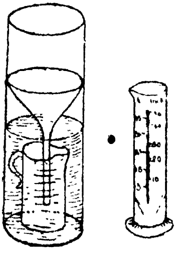
which raged about two hundred years ago, blew fiercely for five days and five nights. Hundreds of thousands of trees were torn up by the roots; chimney-stacks and even houses were blown down.

11. "The storm drove the tide high up the rivers, and caused floods in which many people were drowned. Off the coast the waves were so fierce and high that they wrecked thousands of ships and strewed the shore with broken timbers.

12. "Our weather-watchers are now able to foretell coming storms, and thus to warn sailors and fishermen. At all seaside places a cone is hoisted when a storm is expected."

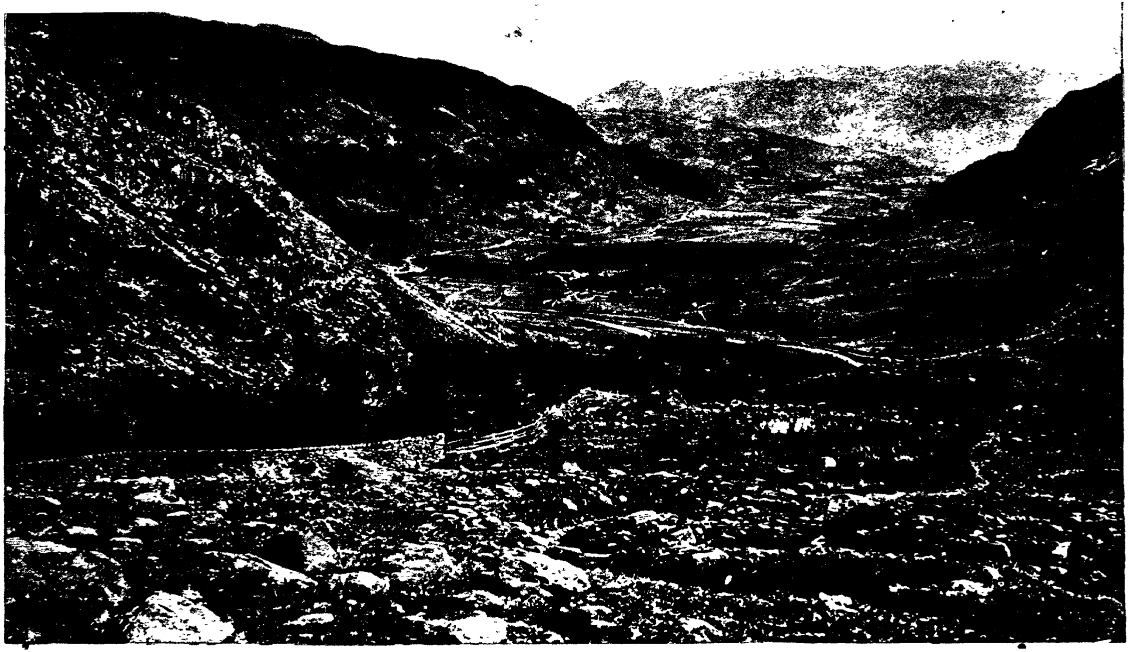
16. WHAT IS THE RAINFALL?

1. "You know how to find out the heat and the pressure of the air, also the direction and force of the wind. We must now learn how to measure the rainfall at a given place in the course of the year.



2. "This is quite easy to do. I have here a rain gauge. It is simply a copper jar with a funnel in it. When the rain falls, it runs down the funnel into a little jug.

3. "Every day, at the same hour, a weather-watcher visits the rain gauge, and pours the rain which he finds in the jug into a little glass. This

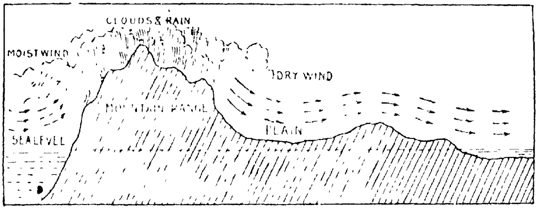


“THE WETTEST PLACE IN ENGLAND.”

(*Photo by Abraham.*)

glass has marks on it showing inches and parts of inches. The weather-watcher notices how many inches or parts of an inch of rain have fallen, and this number he sets down in a book.

4. "You already know that it is the cooling of the clouds which causes rain. When the clouds are driven by the wind against a mountain or hill, they rise, and in the higher and colder air become chilled. They are then turned back into water, which we call rain.



5. "On the other side of the mountains the wind sinks to a lower level. In doing so it becomes warmer, and blows over the low ground as a drying wind.

6. "As the mountains are the chief rain-makers, you will expect more rain to fall in highland countries than on plains. Let us see what the gauge has to teach us about rainfall on highlands and lowlands.

7. "If you look at a map of Great Britain, you will notice that the mountains are chiefly in the west, and that the east of England is largely a plain. The west, then, ought to have a heavier rainfall than the east.

8. "We find that at Styhead, amidst the mountains of Cumberland, no less than one hundred and seventy-

The Rainbow.

(From the picture by H. Clarence Whaite, P.R.C.A., in the Nottingham Art Gallery.)

cloud covering the whole sky. You will hear people call this a 'mackerel sky,' because the little clouds look something like the scales of a mackerel. There is an old rhyme which says,—

> 'Mackerel sky, mackerel sky,
> Not long wet, and not long dry.'

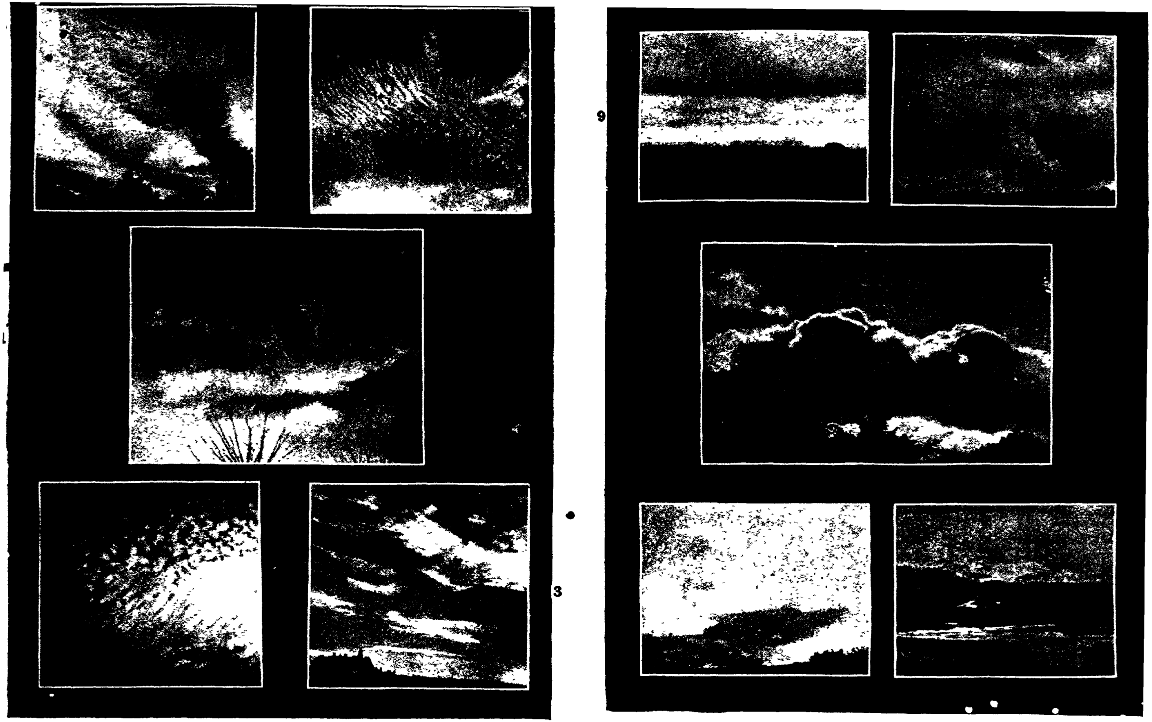
4. "Sometimes you see great white billows of cloud, flat underneath, but shaped above into forms of wonderful beauty. The lower part of these heaped-up clouds is not much more than three-quarters of a mile above the earth, but the tops may rise as high as two or three miles.

5. "These clouds are sometimes called 'day-clouds,' because they are formed by the warm moist air rising up from the heated ground. If they fade away towards evening, they betoken fine weather; if, however, they gather as night comes on, there will very likely be rain or hail.

> 'A round-topped cloud with flattened base
> Carries rainfall in its face.'

6. "The lowest clouds of all lie in long layers not far above the earth's surface. Sometimes they rest on it. When these clouds grow black or dark gray in colour, we call them rain-clouds; when they cover the sky, we may be sure that rain will fall before long.

7. "When the clouds come down to earth we call them *mists*. In a highland country you may often see the mists clinging to the tops or sides of the hills.



- DIFFERENT FORMS OF CLOUD.

If they hang there for some time, we usually expect wind and rain; if, however, they rise or disappear, then we may look for fine weather.

8. "A drier mist is called a *fog*. A fog is simply a mist which does not wet the things which it touches. Fogs are not formed in windy weather. They are driven away when a breeze springs up.

9. "Before I close this lesson let me tell you something about the most beautiful sight which we can see in the sky. Every boy and every girl has seen a rainbow. The poet says,—

> 'My heart leaps up when I behold
> A rainbow in the sky;
> So was it when my life began,
> So is it now I am a man.'

10. "Here is a solid triangle of glass. Look through it, and you will see a band of colour—red, orange, yellow, green, blue, indigo, and violet. How are these colours produced?

11. "White light, you must know, is a mixture of all the colours which I have named. We can prove this by painting a card in bands of the seven colours and whirling it round quickly, when it will appear white.

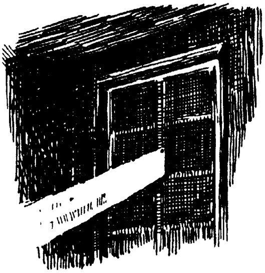
12. "Now tiny drops of water act like this solid triangle of glass, and break up white light into the seven colours. When the sun shines on falling rain the rays of light are broken up, and we seem to see a great arch of colour in the sky."

18. DUST.

1. "Of what use is dust?" asked teacher.

"No use at all, sir," replied Mary Barker. "It is only a trouble, and gives us a great deal of work in the house."

2. Teacher smiled. "Too much dust is no doubt bad for us," he said, "and if allowed to lie would do us much harm. But perhaps you will be surprised to learn that without dust there would be no daylight, no blue sky, no sunset, no clouds, mist, fogs, rain, or snow.



3. "Watch a sunbeam pass into a dark room through a chink in the shutters. How it lights up the room at once! In the beam you see thousands of bits of dust gleaming like gold. It is the dust which throws back the light of the sun and spreads it around.

4. "Without the dust we should not see the sunbeam at all till it fell on the floor or the wall. It is the dust which gives us our soft, pleasant daylight. Without it there would either be a strong glare of sunshine or a black shadow in which we could see nothing.

5. "There is always a great deal of dust in the air. Every puff of cigarette smoke is said to contain four

thousand million specks of dust. Think of the vast quantities of dust which arise from fires, factories, mines, flour-mills, and the surface of the ground!

6. "Of course, there is most dust in the air of crowded cities, but there is a great deal of dust even in the purer air of the country. Even the air on the top of our highest mountains carries specks of dust. Some of this dust comes from the breaking up of other worlds than ours.

7. "You would expect to find more dust nearer to the surface of the ground than higher up in the air. This is so; and we find, too, that the specks of dust grow smaller and finer the higher we ascend. For this reason the clear sky looks blue, and the sunrise and the sunset are yellow, red, and gold. It is difficult to explain this to you now. You will learn the reason when you are older.

8. "If there were no dust in the air, our earth would not be fit to live upon. Let me tell you why. You know that the earth would be a desert if there were no rain. Now rain cannot be formed unless there is dust in the air. This seems strange, does it not?

9. "You know that vapour rises in the air from the surface of water. This vapour rises higher and higher until it is so cold that it partly turns into water. It cannot partly or wholly turn into water unless there are specks of dust in the air for it to cling to. The moisture settles on the specks of dust, and this forms

the clouds. Without the dust there would be no clouds at all.

10. "On the mountain sides, however, the vapour would meet the ground and be turned into water. There the rain would fall in vast sheets, and would roar down the mountain sides in fierce streams, causing floods.

11. "On the lowlands there would be little or no rain. You know what would happen in this case. The land would become a desert.

"By this time," said teacher, "I think Mary has changed her opinion. Dust is certainly a trouble, but we could not do without it, after all."

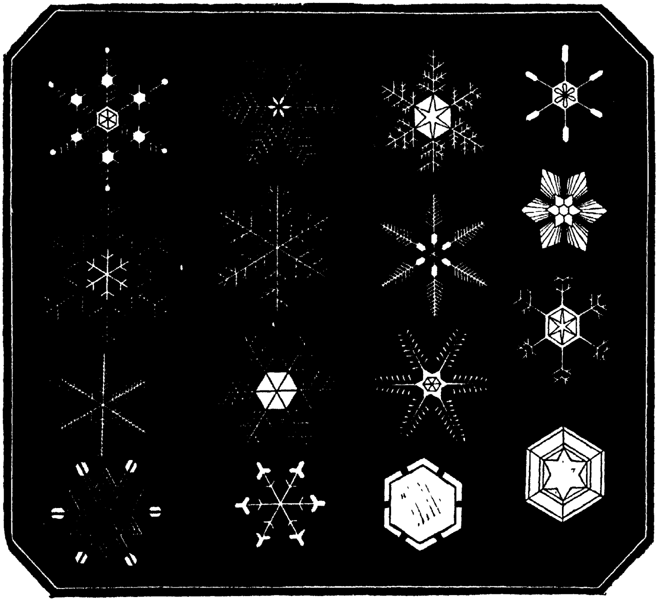
19. SNOW AND ICE.

1. "All boys and girls love the snow. When it falls they make snow men, and fight sham battles with snowballs. I know some scouts who built a snow fort last year. They held it very gallantly against the enemy for quite half an hour.

2. "You know that snow is nothing but frozen rain. Catch a snowflake on your coat sleeve and look at it through a watchmaker's glass. You will notice that it is made up of

a large number of small, clear bits of ice, all hooked and tangled together.

3. "Pick out one of these small bits of ice, or snow-crystals as they are called, and look at it carefully through your glass. What a beautiful shape! You notice that it has either six rays or six sides.



4. "If you examine a hundred different snow crystals, you will find that though they are nearly all different in form, they all have six rays or six sides. Over a thousand different shapes of snow crystals have been drawn. Some of them are shown in this picture.

5. "Sometimes the snow falls so heavily that it

covers the ground to the depth of several feet. The snow remains on the ground as long as the heat of the air is below freezing point. When the thaw comes, the snow melts and becomes water.

6. "Now let me ask you a question. Would a kettleful of snow make a kettleful of water?"

7. None of us knew except Dick Smart. He said, "A kettleful of snow would not make a quarter of a kettleful of water. When our pump was frozen last year, mother had to melt snow over the fire to get water. It took a great deal of snow to make a little water."

"Quite right," said teacher: "one foot of snow will melt into about one inch of water.

8. "On the tops of high mountains and in the regions round the poles the thermometer hardly ever rises above freezing point. This means that the snow remains on the ground all the year round. It never melts, and every snowfall makes it deeper and deeper.

9. "Have you ever noticed the snow on the roofs of houses? It does not always lie there until it melts. Often you see the snow sliding off the roof and falling to the ground. I daresay you have seen a sudden fall of snow come tumbling off a roof on to the heads of passers-by.

10. "The snow that lies on steep hillsides often slides down in much the same way. Sometimes a pistol-shot or a sudden puff of wind will start it. Then the snow

there are great cracks in it, with green walls of ice, and a stream of water at the bottom.

3. "I know a glacier in the Alps which thousands of people visit every year. It is called the Sea of Ice. When I visited it a few years ago, I noticed a number of large stones lying across it. I asked the meaning of these stones.

4. "I was told that the stones had been placed high up on the glacier several years before. They had been placed in a straight line right across the glacier. Since then the river of ice had moved forward, and had carried the stones a long way down the valley. By means of these stones the rate at which the glacier moves is measured.

5. "If you look carefully at a glacier, you will be sure to notice that its sides are covered with stones and dirt, which it has scooped out of the mountain while pushing its way along. Glaciers not only carry with them a vast amount of rock and soil, but they also grind up the ground as they pass over it.

6. "When the glacier reaches the lower part of its valley it melts, and the river of ice becomes a river of water. Many large rivers begin in melting glaciers. You can always tell glacier streams: their water carries so much clay and sand that it looks milky.

7. "When the ice melts, the rocks and soil which the glacier has carried down from the mountains are left behind in the valleys. Thus you see that the glacier

is wearing down the mountain, and piling it up in the valleys. In the course of ages the mountains will be worn down and the valleys filled up. Then the land will be a plain.

8. "In very cold countries near to the poles the glaciers almost entirely cover the land; they move gently down the valleys towards the sea, but they never melt, because the air is so cold.

9. "At the edge of the sea the glaciers are pushed forward until their front is either in the water or overhanging it. Great pieces of ice break off by their own weight and crash into the sea. Then they float away like fairy ships. These *icebergs*, as they are called, sometimes sail thousands of miles to the south before they melt.

10. "Of what use is the snow? Well, first of all, it acts like a blanket. It covers the ground and prevents the heat of the earth from passing away. The ground is thus kept warm and moist, so that the roots and seeds are not killed by the frost. The farmer is glad to see snow in winter, for two reasons—because it prevents the ground from being hard frozen,

and because the melting snow waters his fields in spring.

11. "The snow and ice on the mountains are like great storehouses of moisture. Water in a solid form is stored up on the mountains, ready for use in the hot, dry weather. The glaciers which crawl down the slopes and melt in the valleys give a steady supply of water to the rivers during the hot, dry days of summer."

21. SEEING IS *NOT* BELIEVING.

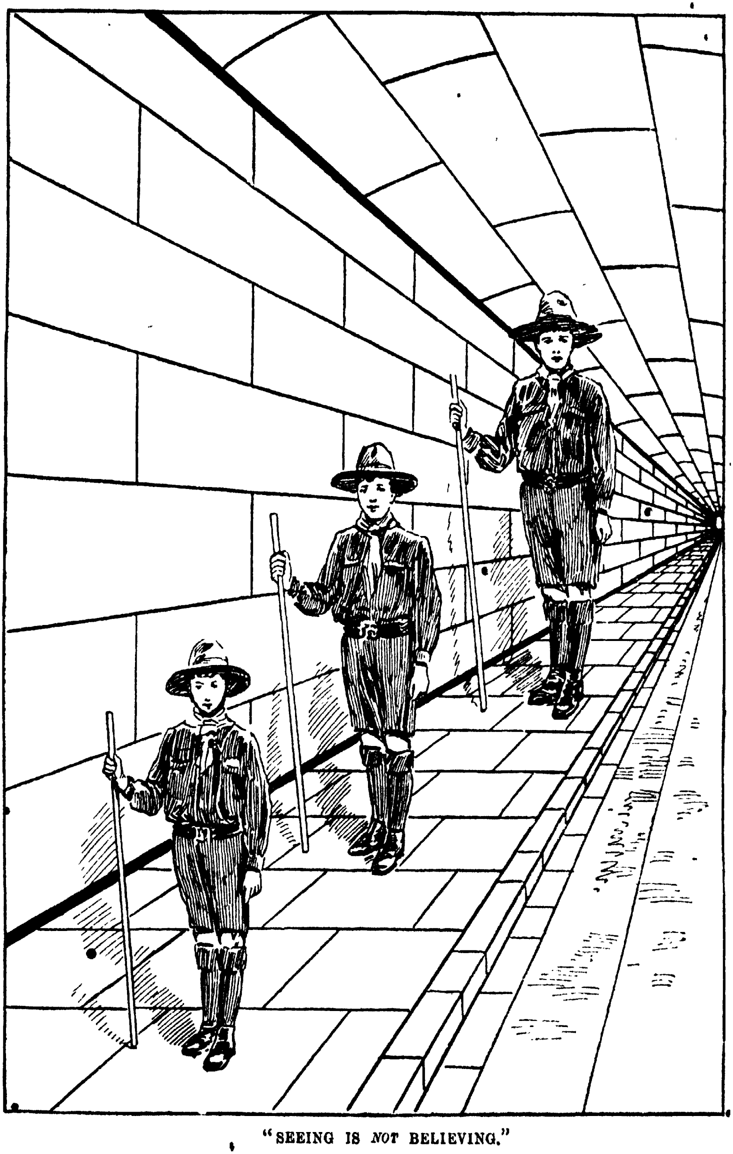
1. "We have talked a good deal about the weather," said teacher, "and now I think some of you are weather-wise. We shall next talk about the ground under our feet. Before we do so, let us understand why night follows day and day follows night.

2. "Last year you learnt that the sun rises in the east and sets in the west. Now I must tell you that it does nothing of the sort. It only *seems* to rise, and *seems* to set.

3. "'What!' you say; 'cannot we believe our own eyes? Have we not *seen* the sun rise and set? Surely seeing is believing!'

4. "Now I want to prove to you that seeing is not always believing, and that your eyes are not always to be trusted.

5. "Have you ever seen a conjurer doing tricks?



"SEEING IS *NOT* BELIEVING."

He makes you believe that he has put a watch into a pistol, and has blown it away. You feel quite sure that you saw him put the watch into the pistol. As a matter of fact, he has done nothing of the sort. While he was talking to you he slipped the watch into his pocket, or put it somewhere out of the way. Your eyes have not served you well.

6. "Look at the three figures in the picture on page 80. I am sure you will say that they are of different sizes. Take a strip of paper and measure them. They are all of the same size. Your eyes have led you astray once more.

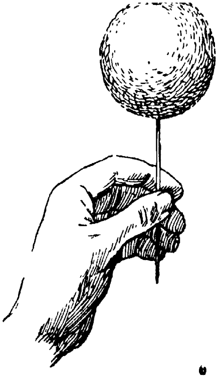
7. "Sometimes you *know* that your eyes deceive you. When you are looking out of the window of a train, you see the hedges and the houses and the telegraph poles flying past you. Of course, they are doing nothing of the kind; *they* are not moving at all. *You* are moving, and they are quite still. But you are apt to forget this, and to think that the things outside are in motion.

8. "It is just the same with the sun. We *think* the sun is moving just as the hedges and the houses seem to be moving when we are travelling in the train. It is the earth on which we live that is moving, and *not* the sun.

9. "You look puzzled. Of course, you cannot feel that the earth is moving. You are so used to it that you never notice it.

10. "We were born on the moving earth, we have lived all our life on the moving earth, and we have never been off the moving earth. We cannot feel the motion, but we are quite sure that the earth *is* in motion.

11. "Here is a humming top. One of the boys may come out and spin it. Now the earth on which you and I live is always spinning round and round like this top. It makes one spin every twenty-four hours, or 365 spins in the course of a year.

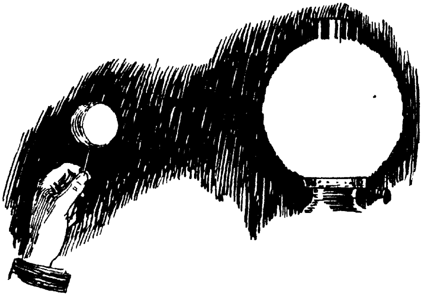


12. "Here is an orange, which, you know, is the shape of the earth. I thrust a knitting-needle through it. The knitting-needle goes in at one of the flattened places on the orange, and comes out at the other. You will remember that these places are called *poles*. If I turn the knitting-needle round, the orange turns round too. The knitting-needle is the axis of the orange.

13. "The earth also turns round on its axis. Pray, do not imagine that it has a great pole sticking through it. There is no real axis of the earth. What we call the axis is a line from the North to the South Pole on which the earth turns round once a day."

22. DAY AND NIGHT.

1. "Here," said teacher, "is a lamp to stand for the sun. I light it and place it in the middle of the table. The orange stands for the earth.



2. "I hold up the earth so that the rays of the sun fall upon it. The half of the earth which is turned towards the sun is lighted up—that is, it has *day*. The half which is turned away from the sun is in darkness—that is, it has *night*.

3. "Now I make the earth spin round on its axis. In which direction must I make it spin?"

We were all silent for a little time.

4. I said to myself, "The sun seems to move across the sky from east to west, but it is really not moving at all. I am moving. When I am in the train, the houses and hedges seem to be moving the *opposite way* to that in which the train is going.

5. "The sun seems to be moving from east to west, therefore the earth on which I live must be moving from west to east."

6. Teacher praised me for my answer. Then he wrote on the blackboard: "*The earth spins round on its axis from west to east.*"

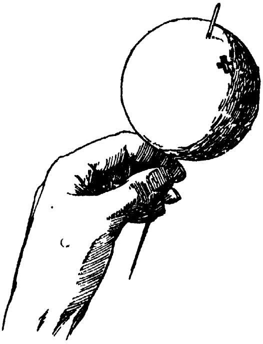
7. Next, he cut a cross on the peel of the orange. "This cross," he said, "stands for our country." Then he turned the orange round so that the cross was in the shade. "Now it is night, and we are in bed fast asleep."

8. He turned the orange slowly from west to east. By doing so he brought the cross round until it was just on the edge of the ring of light made by the lamp.

"Look," he said: "in a moment we shall see the sun rise to the *east* of us."

9. The light fell on the cross, and teacher slowly turned the orange onwards.

"The morning is passing," he said. "The sun is rising higher and higher in the sky. Now the cross comes right opposite to the sun. It is noon, and school is closed for the dinner hour.



10. "The cross still moves on through the afternoon, and all the time the sun seems to be moving towards the west and sinking in the sky. Now we are slowly passing out of the light into the darkness, and the sun appears to be setting in the west.

11. "Night has come. Through the night the cross travels on until it comes to the west again. Once more the sun seems to rise at the beginning of a new day.

12. "What great travellers we all are!" said teacher. We were surprised to hear this, for few of us have ever been many miles from our village.

"Yes," he went on, "we are wonderful travellers. We travel nearly 25,000 miles every day of our lives.

13. "Every moment of our lives we are travelling onwards, with never a pause or stop. Sleeping or waking, working or playing, we are travelling on all the time. We travel far faster than the fastest railway train. We travel more than 1,000 miles an hour."

23. A VISIT TO THE QUARRY.

1. On Saturday morning we had a great treat. Teacher took us to see the quarry at which Willie Winter's father is foreman.

2. The quarry is a big hollow in the hillside, about two miles away from school. Our church and our school were both built of limestone taken out of this quarry. The limestone is hard and firm, and buildings made of it will last for hundreds of years.

3. Teacher took us to the bottom of the quarry, and told us to keep our eyes open. We first watched the men working. Some of them were driving wedges into the cracks of the

AT THE QUARRY.

rock, so as to loosen it; then they broke away the stone with iron crow-bars. At the bottom of the quarry other men with mallets and chisels were dressing the rough stone into shape.

4. I saw one gang of men boring a hole in the rock, so that they could fire a blast. First, they poured water on the rock to soften it; then they began to work a drill, which bored its way deeper and deeper into the rock.

5. One of the men let me feel the drill after it had been working for a little time. It was quite hot! The man said that if he did not keep on cooling the drill in water it would become red-hot.

6. Soon the drill had made a long, round hole. Then the men cleaned the hole out very carefully, and put a charge into it. By this time teacher had taken us all to a place of safety. Suddenly we heard a bugle blow, and saw the quarrymen throw down their tools and run for shelter to little huts and other places.

7. There was silence for a short time, and then we were startled by a loud roar like thunder. A great cloud of smoke rose up, so that we could not see what was taking place. After a time teacher let us go into the quarry again and see for ourselves what a large amount of rock had been thrown down.

8. After we had looked about us for a little time teacher called us together. We formed a ring about him.

"Children," he said, "we shall talk about this quarry in our next lesson. Now I want you to go scouting, so that you can find out all about it for yourselves. Begin at the top of the quarry and tell me what you see."

9. We told him that we could see the grass growing, and that underneath the grass we could see the soil, but that there was not much of it. Then came the rock, which did not seem to be all in one piece, but in layers, one on the top of the other. Teacher made us count these layers. There were twelve of them.

10. "We call these rocks which lie in layers *bedded rocks,*" said teacher, "because they lie in beds one above the other. They go very deep down. The bedded rocks in this country are about twenty miles thick.

11. "Now search about in this rubbish heap and see what you can find."

Teacher took us to a place where the bad and broken stone was heaped up. We searched about for some time. Suddenly Jim Blake shouted, "I've got it."

12. We all crowded round to see what he had found. He showed us a bit of rock full of shells of all sorts and sizes. It was like a museum of shells. Before long most of us had found a bit of shell-rock like Jim's.

24. THE SOIL.

1. At the beginning of our next lesson teacher said, "I want you to think about the quarry which we visited last Saturday.

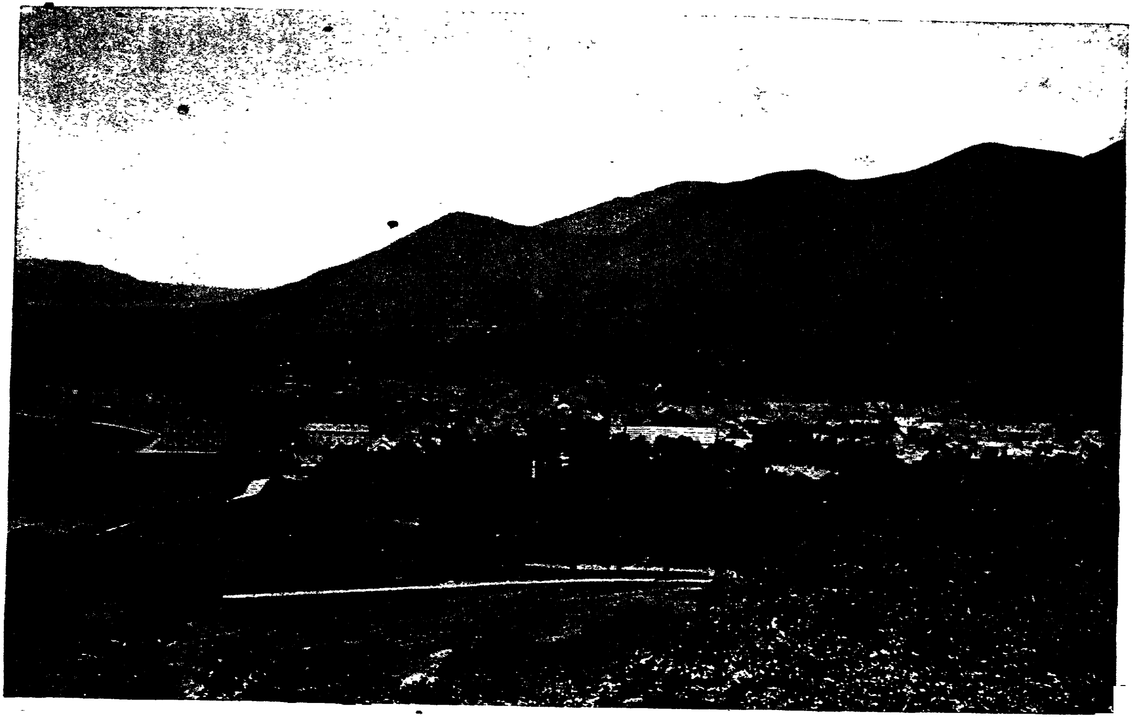
2. "We then looked at the 'crust of the earth.' You noticed that it was built up of rocks. On the top of the rocks you saw the soil in which the grass and all other plants grow. I wonder how it got there."

We were all silent. None of us knew.

3. "Try to remember what you learnt about the action of heat, rain, and frost on the rocks at the top of Fern Hill. You know that heat, rain, and frost are nature's quarrymen, and that they work night and day, year in, year out, without ever ceasing. They break up the rocks, and thus form soil.

4. "If the rocks break up into sand, they form a sandy soil; if they break up into clay, they form a clayey soil; if they are of chalk, they form a chalky soil. Sometimes the rocks are of different kinds, and then they break up into a mixture of soils which is very good for farming.

5. "You must not suppose that all the soil in a place has been made by the breaking up of the rocks in that place. Rivers, as you know, bring down a great deal of soil from far-off places to distant valleys. In many



A RANGE OF ENGLISH HILLS—SKIDDAW.

places you will find rich lands which were once the beds of rivers or lakes. Glaciers also carry down to the valleys rich soil from the mountains.

6. "Think for a moment of the different uses to which we put the land in our parish. Some of it is used for gardens round our houses; on large fields we grow crops of wheat or turnips or potatoes; wide stretches of land form pastures for the cattle; and on the hillside there are thousands of acres on which the sheep graze. What is the difference between garden land, farming land, pasture land, and the sheep-walk?

7. "In the garden the soil is deep, rich, and soft. Very likely much of it was brought from elsewhere. It is carefully tended and manured, and is, therefore, very fertile. Beautiful flowers grow in the beds, and the apple trees and pear trees on the south wall are laden with fruit.

8. "The soil of the wheat field or the turnip field is not so deep and rich as that of the garden, but still it is fertile. By ploughing it and manuring it, the farmer makes it still more fertile, and thus it produces better crops.

9. "On the hillside the soil is poor and thin, and only grass and heather will grow on it. The farmer could not make such land pay the cost of tillage. It is, therefore, used as a grazing ground for sheep. On the top of the hill, where the bare rocks stick out of the ground, nothing useful for food will grow at all.

10. "Now I think you understand that the use to which land is put depends on the kind of soil which it has. It depends on something else too, and that is the weather which it enjoys. Our gardens, for example, have not only the best soil in the parish, but the best climate too. They are sheltered from cold winds by walls and hedges, and are so placed that they get as much sunshine as possible.

11. "The wheat fields and the valley pastures have better soil and better weather than the sheep-walk on the hillside. The higher the land the colder the air. You may often see mists hanging on the hills when there is sunshine down below. The snow falls earlier on the hills, and remains there after it has melted in the valley.

12. "Remember that good soil and good weather make a rich farming country. Bad soil and bad weather make a poor farming country."

25. BEDDED ROCKS.

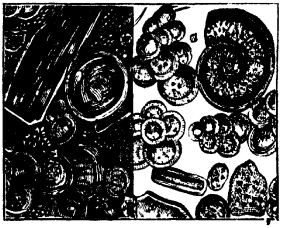
1. "Now let us go back to the quarry. You noticed that the rocks of the quarry were not all in one piece, but that they were in layers. I called these rocks *bedded rocks*. To-day we will try to discover how they came to be laid down in this way.

2. "Look at the shells in the pieces of limestone

8. "In the course of ages the land sank once more, and again the waves rolled over it. Once more a bed of shells was laid down on the top of the old bed. The pressure of the new bed made the old bed harder and hotter than it was before, and thus changed the rock a great deal.

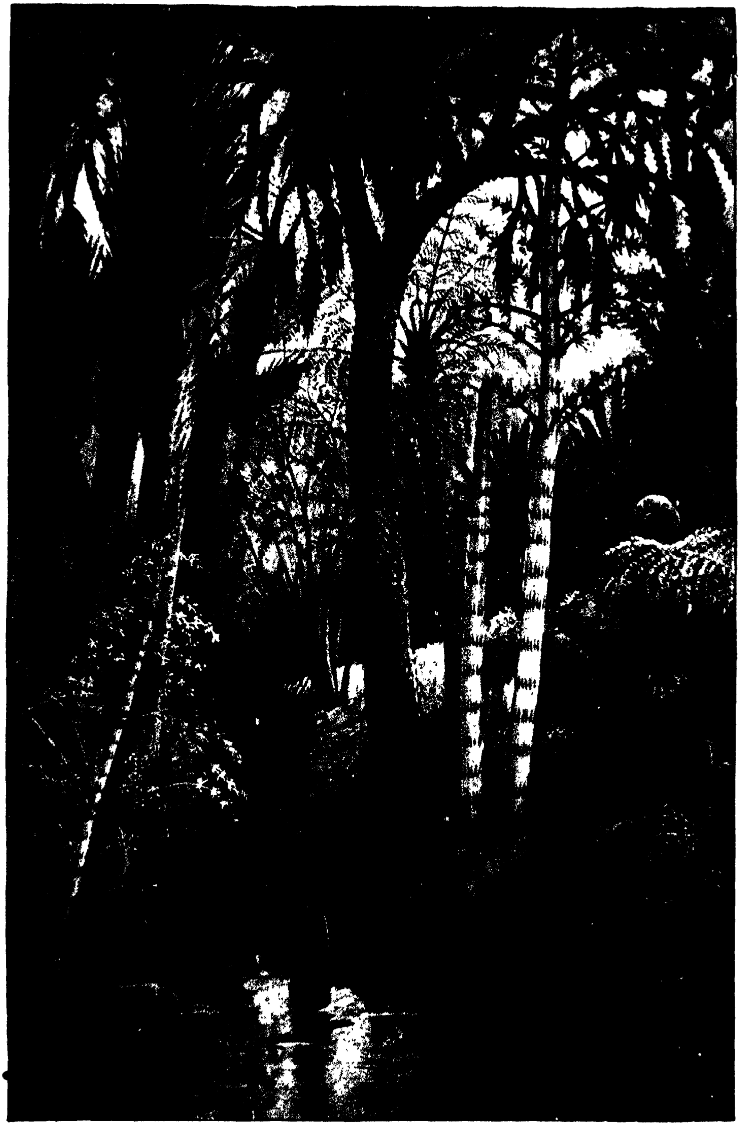
9. "You counted twelve beds in the quarry. This shows you that the land must have been sunk beneath water at least a dozen times. No doubt it was sunk and raised scores of times; for, as you know, the bedded rocks in our country are about twenty miles thick.

10. "Here is a piece of chalk broken off from chalk rock. Let us brush some dust off it and look at it through a magnifying-glass. What do we see?



11. "We notice at once that it is built up of tiny shells—millions and millions of them. The little creatures whose shells form the chalk rock are found living in the sea even now. From this we learn that chalk rocks were also formed beneath the waves, and that they are built up out of the dead remains of tiny sea animals.

12. "Here is a piece of sandstone. I pound it up with a hammer, and you see that it is built up of grains of sand. If you look closely at the grains, you will see that they are like those on the seashore.

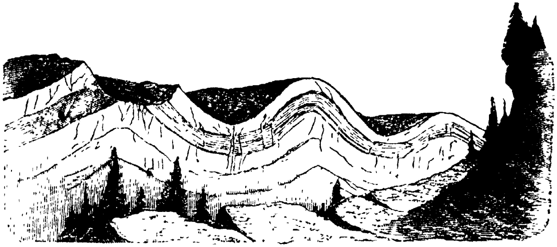


A Coal Jungle.

13. "Here, too, is a piece of slate. I pound it up and mix it with a little water. You see that it is simply mud. Sandstone and slate have both been formed under water. They are new rocks made out of old rocks.

14. "From what I have told you about bedded rocks, you might expect to find them lying evenly the one on the top of the other, like clothes on a shelf. This is not so everywhere.

15. "The earth, as you know, is always shrinking, and this shrinking squeezes the crust into folds. In this way the beds are tilted up, or set on edge. In our quarry the beds lie evenly, the one on the top of the other, but you must not expect to find them like this in all other places."



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26. SUNSHINE OF LONG AGO.

1. "In bedded rocks we often find traces of animals, and plants that were living when the rocks were being formed. These traces we call *fossils*.

2. "On some bedded rocks we find the footprints

which were made by animals on the soft sand or clay ages ago. Sometimes we find the hard parts of plants or animals—such as bark, roots, shells, teeth, or bones—in the rock. Where the animal or plant has rotted away altogether we often find a mould of it.

3. "Now, when we look carefully at these fossils, we find that they show us plants which now only grow in hot places, and animals which now only live in warm waters. From this we learn that once upon a time our islands were as hot as India or the middle of Africa.

4. "At that time great pine trees and huge ferns, reeds, and mosses grew in our country. Almost the whole land was covered with thick jungles. Then the land began to sink, and shallow water covered it. Rivers brought down mud and sand which buried the jungles. After many years the mud and sand became beds of rock.

5. "Then the land rose again, and when it became dry, trees and plants grew as thickly as before. Then the ground sank once more, and again water covered it, and new beds of mud and sand were formed. This happened time after time.

6. "The buried trees and plants rotted and gave out heat, and were closely pressed together by the weight of the mud and sand above them. In course of time they became that hard, shiny substance which we call

coal. You may often find a piece of coal with the print of a fern leaf on it.

7. "A collier will tell you that underneath the coal there is a bed of what he calls fire-clay. In this clay we find the roots of the trees and plants that now form the bed of coal. Above the coal we find sandstone and what is called shale—that is, mud which has been hardened and baked into rock. In the sandstone and shale we often find the remains of stems, leaves, fruits, and flowers.

8. "From this we learn that when a collier is hewing coal deep down in the earth he is working in a very old forest. Once upon a time that forest was on the surface of the earth, just as our forests are now.

9. "The sun shone upon those trees and plants and made them grow. Because of this we sometimes say when we sit by a coal fire that we are warming ourselves with the sunshine of long ago.

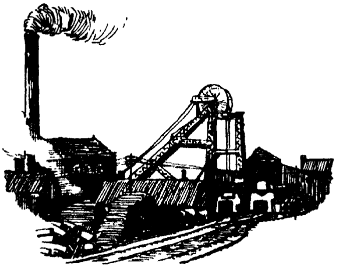
10. "In a coal-pit there may be several layers or 'seams' of coal, one above the other, with thick beds of rock between them. Every seam of coal tells us of a time when the land was just above the water. Every bed of rock tells us of a time when the land was covered with water.

11. "Coal is so plentiful in Great Britain that it gives us the greater part of our wealth. In some parts of England there are thirteen seams of coal, one above the other, with beds of clay and sandstone

between them. Some of the seams are very thin, but some of them are as much as ten yards thick."

27. A VISIT TO A COAL MINE.

1. "We are now about to visit a coal pit in order to see for ourselves how the miners win 'black diamonds.' Put on your oldest clothes, and we will make our way to yonder ugly mound of refuse. At the top of it you see the head-gear of the mine.



2. "Here is the 'cage,' ready to descend. Step into it and hold tight. A bell rings, the wheel above us begins to turn round, and down we go into the darkness.

3. "We are now at the bottom of the shaft, more than a quarter of a mile below the surface of the ground. Here our guide hands each of us a safety-lamp, and we climb into a truck which is drawn along rails by an endless rope.

4. "Our truck travels along the main road of the mine. Every now and then we pass trucks full of coal running to the foot of the shaft. As we run along, we notice the great props of timber which prevent the roof and walls from falling in. Narrow

roads, called 'gateways,' branch off right and left from the main road.

5. "At the entrance to one of these gateways we descend from the truck and walk along a low, narrow road to the 'coal-face.' Here we see a miner, stripped to the waist, squatting on his heels and working away at the coal with a pick. Sometimes he breaks down the coal with an iron bar or by means of gunpowder.

6. "In some mines what is called 'under-cutting' is done by a machine called the 'iron man.' It is worked by compressed air or electricity, and will do the work of from fifteen to twenty men.

7. "The miner breaks up the fallen coal into pieces small enough to go on a truck. A man called a 'filler' puts the coal on the truck, and when it is filled a boy pushes it along the gateway to the main road. Here it is fastened to the endless rope, and is drawn along the rails to the bottom of the shaft, from which it is lifted to the surface.

8. "Coal-mining is very dangerous work, and scarcely a month passes without loss of life in the pits. Underground water may be tapped, and may rush into the 'workings' and drown the miners; they

may be crushed by a fall of coal; or the roof of a gateway may fall in and imprison them in a living tomb.

9. "The chief danger, however, is caused by the gases given off by the coal. One of these gases is called fire-damp. A naked light will cause fire-damp to explode with such terrific force that frequently a mine is wrecked and the men in it are blown to pieces. To guard against this danger safety-lamps are used.

10. "Strange as it may seem, coal-miners watch the barometer very carefully. Let me tell you why. When the barometer is high the pressure of the air in the mine is great, and the coal cannot give off gas very easily.

11. "When the barometer falls it shows that the pressure of the air has become less. The coal can now give off its gas more easily, and thus there is a greater danger of explosions."

28. FIRE-FORMED ROCKS.

1. "Do you remember the miner whom we saw working in the pit? He was stripped to the waist. The quarrymen whom we saw working in the quarry wore their shirts and waistcoats. Why does the miner remove so much of his clothing when he is at work in the pit?

2. "If you go down a pit, you find that the ground gets hotter and hotter the deeper you descend. The

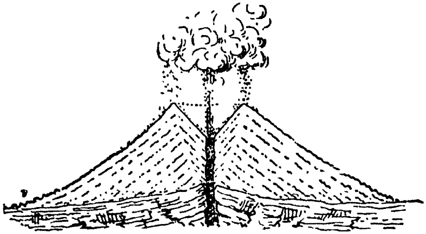
air at the bottom of a pit is so hot that the colliers are glad to take off as much clothing as possible.

3. "It is said that at a depth of thirty miles the heat of the earth is so great that it would melt every known thing. At this depth the very rocks are molten.

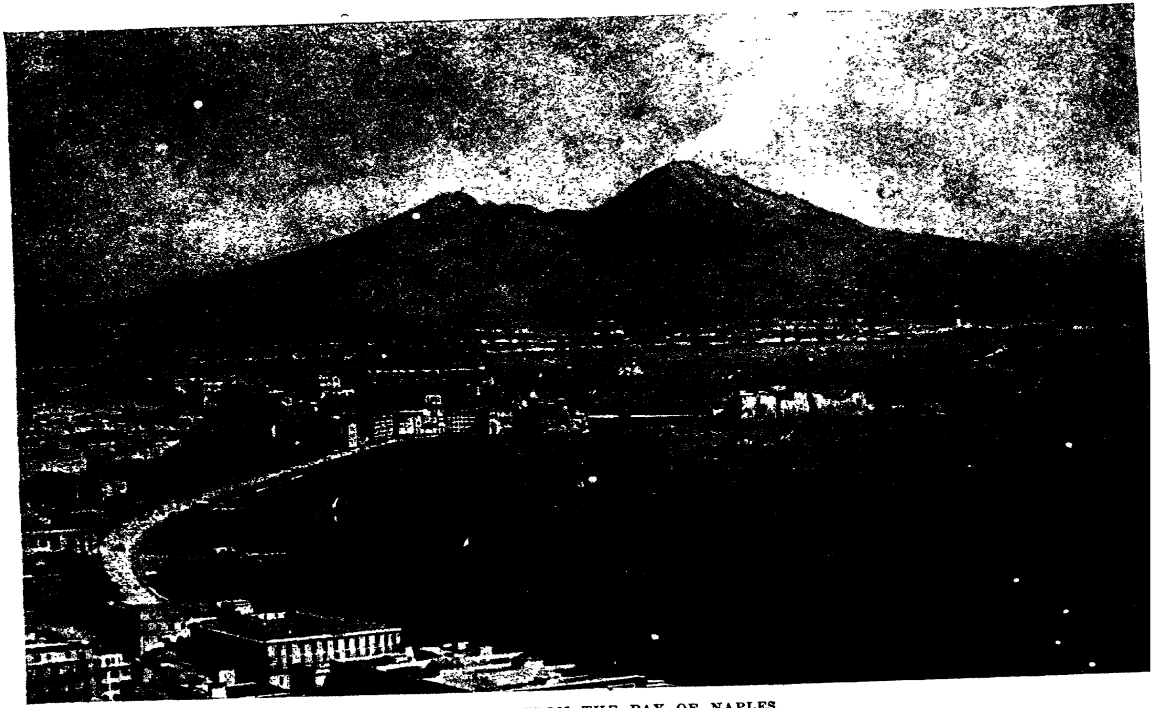
4. "Now, what would happen if water were to work its way through cracks in the rocks to these very hot depths? The water would at once become steam, and would expand with terrific force.

5. "This often happens, and steam of very high power is produced. So powerful is this steam that it bursts through the rocks above. Out of the hole which it makes in the ground it hurls showers of red-hot ashes and streams of molten rock called lava.

6. "Such a hole in the earth's crust is called a *volcano*. Sometimes a volcano is said to be a burning mountain. This is quite wrong. A volcano is not a mountain, and it does not burn; it is simply a great bore reaching far down into the earth.



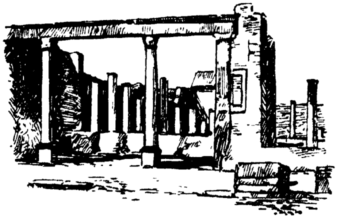
7. "The matter which is thrown out of a volcano piles itself up round the opening or *vent*, and forms a mountain of sugar-loaf shape. This opening, out of which the steam, ashes, and lava are hurled, is known as the *crater*.



VESUVIUS—FROM THE BAY OF NAPLES.

the terrible scene. While the people were fleeing from the city the Roman soldier never dreamed of leaving his post. He was 'faithful unto death.'

14. "The showers of ashes buried the cities so deeply that they were quite covered up. They remained so for hundreds of years. Now they have been dug out, and we can visit them. We can see the ruins of whole streets of houses, the shops with the oil jars still in them, and the roads with the ruts of chariot wheels, just as they were more than eighteen hundred years ago.

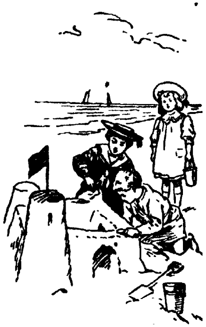


15. "There are many volcanoes now at work in various parts of the world, but there are none in our country. We can, however, find the old craters from which lava flowed in the days of long ago. The softer rocks around them and upon them have been worn away in the course of ages, and now they stand up boldly as hills.

16. "We call the rocks which once upon a time were hurled out of volcanoes *fire-formed* rocks. Most of the fire-formed rocks in our land consist of granite. In some places the heat of the fire-formed rocks has changed the bedded rocks so much that they look like fire-formed rocks. Limestone, for example, has been changed in this way into hard, beautiful marble."

29. BUILDING UP AND BREAKING DOWN.

1. "You have all been to the seaside, and have played at building castles of sand. With your buckets and spades you heaped up the sand until it looked something like a fort with towers and gateways. When it was finished and a little flag waved on the topmost tower, you ceased your work and waited for the tide to come in.



2. "You watched the little waves run along the sands like fingers. Little by little they drew near to your castle until they lapped at its base.

3. "Soon the lower part of it was wet and soft, and the upper part began to tumble down. In a few minutes it was a shapeless ruin. At last the waves covered it altogether. They spread out the heaped-up sand evenly until there was no sign that a castle had ever stood on the spot.

4. "Now, just as the castle was built up and the sea broke it down, so the crust of our earth is always being built up and broken down. The work of building up and breaking down never ceases. It began when the earth was made, and it will never stop until the world comes to an end.

5. "You know that the earth is always shrinking, and that this shrinking causes some parts of its crust

to be slowly lifted up above the sea, while other parts are slowly sunk beneath the waves. Thus the surface of the earth is always changing.

6. 'There rolls the deep where grew the tree;
O Earth, what changes thou hast seen!
There where the long street roars hath been
The stillness of the central sea.'

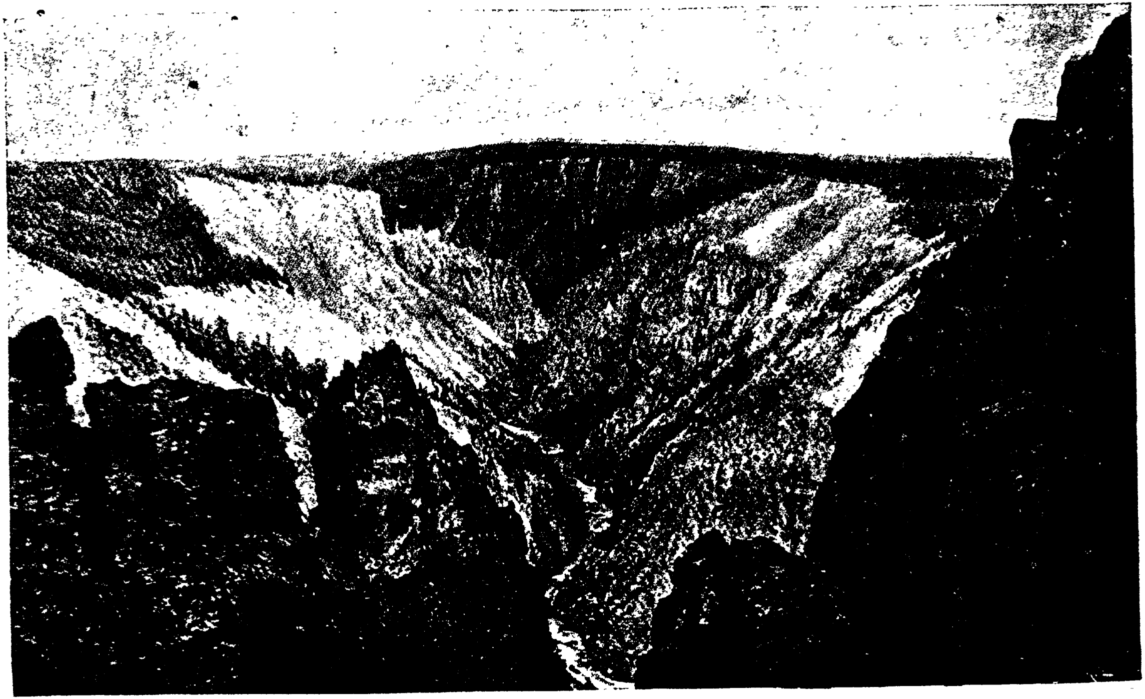
7. "Rain, frost, and running water are always busy breaking down new land and old land alike. The poet tells us,—

'The hills are shadows, and they flow
From form to form, and nothing stands;
They melt like mist; the solid lands
Like clouds they shape themselves and go.'

8. "Now we must learn something of the way in which the solid lands shape themselves and come and go like clouds. See, a heavy shower of rain is falling. Come to the window and look out."

9. We gathered round the windows and watched the heavy rain-drops beating down on the road. When we had watched a little time we went back to our places, and teacher asked us to tell him what we had seen.

10. We told him that we had noticed little streams of water running down the road. They seemed to cut little grooves in the soft road, and thus make channels for themselves. Every now and then a little stream joined another stream and made it larger.



A RIVER'S WORK.

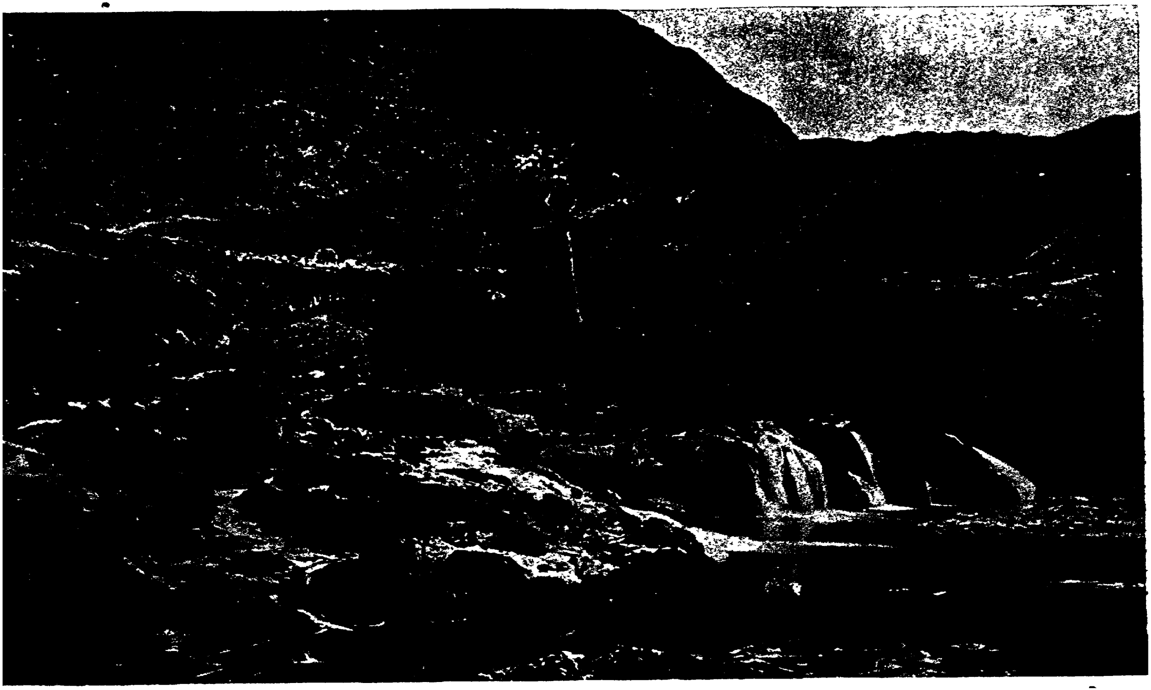
11. "What kind of water is running down the road?" asked teacher. "Muddy water," we cried. In reply to other questions we said that the mud was swept off the road by the little streams, and that it was being carried into the ditch by the side of the road.

12. "Now," said teacher, "you have seen on a small scale how the solid lands come and go. The work which the little rain-streams are doing on the road is the same kind of work which rivers are doing all over the earth.

13. "Rain, frost, and heat are always breaking down the hills. The rivers are always carrying them away to the sea, so that, somewhere or other, they can be built up again into new land.

14. "Rivers are the great land-levellers. Whether a river is large or small, slow or swift, it is always at work carrying earth, sand, and stones from higher ground to lower ground. You will be surprised to learn what a great work even a small stream can do in the course of ages.

15. "Study the picture on page 110, and notice what a great cleft the stream has cut in the table-land. Rain and frost wear away the steep banks, which fall into the river and are carried away. Every year the valley of the river grows wider. In days to come the table-land will be a plain."



LEAVING THE HILLS.
(*Photo by Frith.*)

30. SCOUTING BY THE RIVER.—I.

1. "Next Saturday," said teacher, "I want you all to go to Fern Hill and find the source of Bramble Brook. Follow the stream down the hillside until you come to the first bridge. Use your eyes well, and bring me on Monday morning a written account of what you have seen."

2. On Saturday morning a large number of us went scouting on Fern Hill. I took a little book with me and wrote notes in it, so that I should not forget anything when I came to do my exercise.

3. On Monday morning we handed in our exercises, and teacher read them. He said that none of us had seen all that we might have seen. However, he took the three best of the exercises, and made them into one. This he gave us for dictation. Perhaps you would like to read it.

4. "Bramble Brook rises high up on Fern Hill. The water gushes out of a spring which is under a big rock. The spring forms a pool, and the water which overflows from this pool is the beginning of Bramble Brook.

5. "Down the hillside the brook runs swiftly. This is because the slope is steep. The water has dug out for itself a deep trench all the way down. In this trench there are many large stones.

6. "I think that most of these stones used to be by

the side of the stream. They have tumbled in as the banks have been worn away. I looked at some of the stones which seem to have been in the stream for a long time. Their edges are not sharp, but have been rounded by the running water.

7. "I did not notice much mud in the stream high up on the hillside. I think this is because the ground is very rocky. Lower down in the softer ground there is a good deal of mud in the water. I also noticed many rounded stones and much gravel in the bed of the stream.

8. "At the foot of the hill the brook is joined by a smaller stream or feeder. Between the foot of the hill and the bridge I counted three other small streams which join Bramble Brook. I followed up one of these smaller streams, and found that it had feeders too.

9. "The smaller streams running into Bramble Brook make it much larger at the foot of the hill than it is higher up. Near its source I can easily jump across the brook. At the bridge I had to wade across. It took about eight steps.

10. "On the hillside I noticed that the trench which the stream has dug for itself runs straight down the slope. On the lower ground the stream begins to wind about.

11. "I looked carefully at the banks of the lower stream, and found that in many places they have been worn away underneath, and that the upper part of

them is hanging over the water, ready to tumble in. I think the small pebbles and the gravel in the stream wear away the banks. They are driven against the banks by the force of the stream, and break them away.

12. "I noticed that the bridge is wider than the stream. I suppose this is because the stream overflows its banks when the floods come roaring down the hillside. I also noticed that the arch of the bridge is a good deal higher than the level of the water. I think it was built in this way to let the water at flood time run under the bridge.

13. "I cannot say how fast the stream runs by the bridge, but it does not run so fast as on the hillside. I tested this by throwing a stick into the stream on the hillside and at the bridge.

14. "I also noticed that a stick in the water near the bank does not move along so quickly as a stick in the middle of the stream. This proves that the rubbing of the water against the banks checks the flow of the stream."

THROUGH THE MEADOWS.

31. SCOUTING BY THE RIVER.—II.

1. On the next Saturday we again went scouting by the brook. This time we walked along the banks from the first bridge to the place where the brook joins the river Stour.

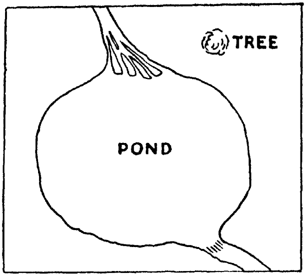
2. We wrote out our accounts of the walk, and gave them to teacher. When he had examined them, he said that they were much better than those of the week before. He took bits from the best papers, and dictated the following to us:—

3. "At the first bridge the hills between which the stream flows are not very far apart. As we followed the stream I noticed that the distance between the hills grows greater and greater. This means that the valley of the stream gets wider and wider.

4. "In this part of the valley the brook flows through green meadows. The ground on each side of the stream is flat right up to the foot of the hills. On these meadows the grass grows very well. Large numbers of cattle are fattened for market on these valley pastures.

5. "During this part of its course the stream runs rather slowly, and makes many loops and bends. I noticed that where the river makes a bend one bank of the stream is higher than the other. The higher bank is on the outside of the curve; the lower bank is on the inside. The lower bank has a shelving slope of gravel and sand.

pond has more water than it has in dry weather. Last summer the water in the pond was very low.



4. I walked round the pond to see if I could find anything to prove that the water had been higher than it is now. Along its shores I found lines of sticks, straws, and leaves, which had been left behind when the water sank. These lines are just the shape of the pond; they fringe the shore all the way round.

5. I spent a good deal of time in noticing how the stream runs into the pond. I soon found that the stream does not enter the pond by one channel, but by several narrow little channels. Between these channels the ground is very soft and marshy.

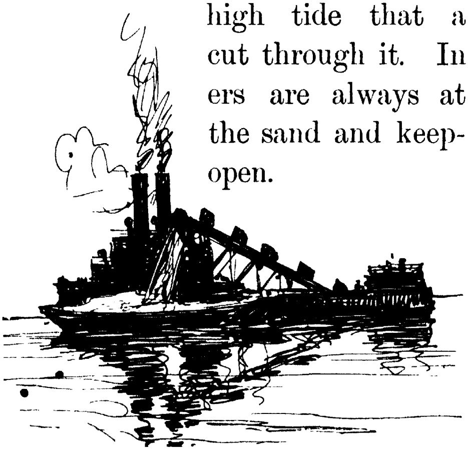
6. I think this soft and marshy ground has been formed by the stream. When it enters the pond its flow is checked, and it can no longer carry its load of mud and sand. This it drops to the bottom, and in time new land is formed.

7. I noticed that this new land is shaped somewhat like a fan, and that it spreads out into the pond from the inflowing stream. The fan must be growing larger every year, and some day it will fill up the pond altogether. Father says that all lakes become filled up in this way. Some of our most fertile land was once the bed of a lake.

8. When we told teacher what we had seen at the pond, he talked to us about the new land which is always being formed at the mouths of rivers. He told us to think of the tongue of land which we saw at the meeting-place of Bramble Brook and the river Stour.

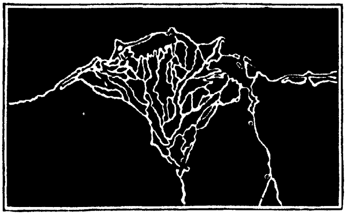
9. "When a river runs into the sea it usually forms a shoal or sandbank at its mouth. Sailors speak of it as a *bar*, because it bars the way for ships. A bar is covered by the sea when the tide is in, but is high and dry when the tide is out.

10. "In some rivers the *bar* makes the water so shallow even at high tide that a channel has to be cut through it. In many places dredgers are always at work scooping up the sand and keeping the channel open.



11. "Some slow-flowing rivers bring down so much sand and mud that they form low marshy islands at their mouths. In this case the river has to find its way to the sea through channels between the islands. The new land thus formed is called a *delta*, because it is shaped something like the fourth letter of the Greek alphabet, Δ."

12. When teacher told us this, I knew that the stream running into our pond forms a delta. I was much pleased to think that I had discovered a delta in our parish.



13. Teacher showed us a map of the delta of the Nile in Egypt, where a great deal of cotton, rice, and wheat are grown. Then he showed us a chart of the mouth of the river Thames. I think a delta must be forming at the mouth of this river, because it is full of sandbanks and shoals, some of which are dry at low-water. Teacher says that in years to come the delta of the Thames will be rich farming land.

33. OF WHAT USE IS THE SEA?

1. "Brooks run to rivers, and rivers run to the sea. We have now followed a river to the end of its journey, and we must learn something about the sea. It is, you will remember, the birthplace and the grave of rivers. From it they come; to it they return.

2. "Here is a globe—that is, a small model of the earth. The dry land is painted in various colours; the sea is painted blue. Examine the globe, and you will notice that there is much more water than land on the

The Great Wide Sea.

surface of the earth. At the present time there is about three times as much water as land. For every square mile of land there are three square miles of sea.

3. "Now what is the use of all this sea? Let us try to discover. Put a kettle of water on the fire, and thrust the poker between the bars. When the poker is red-hot, take off the kettle and put your finger in the water. What do you notice?"

4. Teacher called out one of the girls, and asked her to dip her finger in the water.

"Please, teacher," she said, "the water is not very warm, but the poker is red-hot. I could not touch the poker without burning myself, but I can keep my finger in the water without doing myself any harm."

5. "Good," said teacher. "We will now set the poker and the kettle aside to cool."

In a short time he asked me to touch the poker, and to put my finger in the water. I found that the water was still warm, but that the poker was cold.

6. "From this," said teacher, "we learn a very important fact. Solids, such as the poker, take in heat quickly and give it off quickly. Water, on the other hand, takes in heat slowly and gives it off slowly.

7. "The ground on which we tread takes in heat quickly and gives it off quickly, while the sea takes in heat slowly and gives it off slowly. In summer the land is hotter than the sea. This means that the breezes which blow from the sea cool the land.

8. "In winter the sea is warmer than the land. This means that the wind from the sea brings heat to the land. Thus the sea gives coolness in summer and warmth in winter. Lands near the sea are neither so hot as they would otherwise be in summer, nor so cold in winter.

9. "Let me give you an example. In the middle of Canada there is a fine wheat-growing country called Manitoba. It is about as far from the North Pole as London, and therefore ought to have about the same kind of weather.

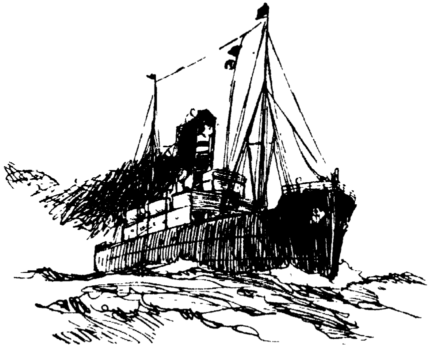
10. "During winter there are frosts in England, but they are not very keen, and do not last very long. In Manitoba the rivers and lakes are thickly frozen, and the snow lies deep on the ground for several months. Manitoba, however, is much hotter than London in summer.

11. "How do we account for this? London stands on an island in the midst of the sea, which tempers its heat—that is, gives it cool summers and mild winters.

"Manitoba stands in the middle of a continent, and the sea cannot temper its climate. It has, therefore, cold winters and hot summers.

12. "You already know that the salt sea is the great storehouse from which comes all the fresh water on the earth. When the vapour rises from the sea to become clouds, the salt is left behind, and

thus the rain which fills our brooks, rivers, and lakes is fresh water and not salt.



13. "You can think of many other ways in which the sea is useful to man. It is the home of the fish which supply him with good and cheap food. It is also the great highway between the nations. In these days of fast steamships oceans unite and do not divide. Ocean carriage of goods is cheaper than land carriage.

14. "We in the British Isles owe much to the sea. Our girdle of water has always been our best bulwark of defence. We might have been conquered many times by foreign nations but for the 'silver streak' which serves as a moat to defend the castle of our land."

34. SCOUTING BY THE SEA.—I.

1. The summer holidays were drawing near, and our geography lessons for the year were coming to an end.

2. One morning teacher said, "Ask your parents to let you go with me to Shell Bay next Saturday.

We will travel by the first train in the morning, and return by eight o'clock in the evening. The railway fare will be one shilling. You will bring sandwiches with you, and I will provide tea.

3. "When we get to Shell Bay I shall divide you into two scouting parties. The first party will scout along the cliffs and the shore and watch the waves; the second party will notice the way in which the people of Shell Bay earn their living.

4. "When we return, each of you will write an account of what he or she has noticed in the course of the day. From your papers I shall draw up a report for each party. These reports I shall dictate to you, and you will write them in your exercise books."

5. We were all very much excited at the thought of a day by the sea. Shell Bay is only ten miles from our village, but many of us had never been so far from home. You may be sure that we gave our parents no rest until they agreed to let us go with teacher.

6. Saturday morning was a long time in coming, but it came at last. The train did not start until half-past eight, but most of us were at the station by eight o'clock. We were all very much afraid of being late.

7. Now, I am not going to tell you all that we did at Shell Bay, because it would take far too long. I am going to give you the reports which teacher drew up from our papers. I belonged to the first scouting party, and this is our report:—

8. "Our chief duty was to examine the shore. We made our way along the sands to the foot of Earl's Cliff. It rises very steeply from the shore to a height of two hundred feet. The cliff is bare rock, but there are many ledges and crannies where grass and hardy plants are growing.

9. "Twice every day the water washes the foot of the cliff. A coastguard told us that in stormy weather the waves beat against the rock with very great force. He said that there was no finer sight than Earl's Cliff in a storm. Then the thunder of the waves is deafening, and the spray is hurled in a white cloud almost as high as the top of the cliff.

10. "At the foot of the cliffs we found a heap of rock that had fallen from above. This is the work not of the sea, but of rain and frost. During storms the sea uses these fallen rocks as battering rams to break down the lower part of the cliff. When the 'stormy winds do blow,' the waves hurl the rocks against the cliff with immense force.

11. "The sea breaks up the rocks, and in course of time they are ground down into sand. We must not, however, imagine that all the sand comes from the

breaking down of the cliffs. Most of the sand on the shore has been washed up by the sea.

12. "We noticed several large stones that had been cast up by the waves. Many of these stones had seaweed clinging to them. The air-bladders of the seaweed buoy up the stones, and thus enable the waves to tear them up easily and hurl them on the beach."

35. SCOUTING BY THE SEA.—II.

1. "We were able to see for ourselves that the sea and the weather have worn away the soft parts of the cliff, and have left the hard parts standing. In one place we found a cave like a tunnel under the cliff.

2. "The softer rocks which once filled up the cave have been worn away, and thus a great hollow has been left. We entered the cave, and disturbed a number of seabirds sitting on their nests. The coastguard told us that many years ago smugglers hid their goods in this cave until they could carry them safely inland.

3. "Amongst the rocks at the foot of the cliff we found little pools left in the hollows by the ebbing

A ROCK POOL.

tide. We spent much time looking into these pools. Some of them are really beautiful. Many of the seaweeds in the pools are lovely in shape and in colour.

4. "Some are like ferns, except that they have no roots. They seem to cling to the rocks just as a sucker clings to a stone. The sea-flowers, too, are very pretty. Some are crimson, others are white, rosy pink, brown, olive, and green.

5. "It is said that there are no less than four hundred and fifty different kinds of seaweed on our coasts. They are either green, brown and olive, or red in colour.

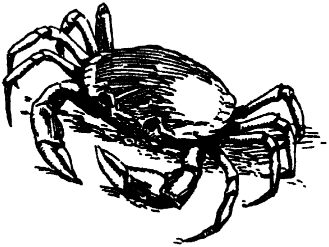
6. "The green seaweeds are chiefly found in the rock pools near high-water mark; the red are found in deeper water; the brown and olive weeds cover the rocks, which are bare at low water. As we walked over these weeds, the air-bladders of the seaweeds were constantly bursting beneath our feet.

7. "Some of the green seaweeds are the food of little sea animals. At the bottom of a rock pool we noticed a number of whelks or sea-snails, which slowly move about with their feelers sticking out from their heads.

8. "A fisherman told us that there is an eye in each of these feelers, and that the whelk's mouth is between them. Its tongue is long and thin, so that it can pierce the shells of other animals and feed upon them.

9. "We were much amused at the crabs running about like spiders on their eight legs, and carrying

their nippers ready for action. We also noticed many limpets. They are like a cone in shape, and they are so firmly fixed to the rocks that even the waves cannot batter them down.



10. "Beyond the cliff we found that the shore was covered with pebbles. We noticed that the bigger pebbles lay higher up the beach than the smaller ones. At first this puzzled us, but we soon saw the reason.

11. "When the waves are running up the beach they have more force than when they are running back. They carry the bigger stones up the beach, but they can only drag the smaller stones back with them.

12. "The pebbles on the beach are smooth and rounded. This is because the sea is constantly rubbing them together and grinding off their sharp edges.

13. "We now returned to the sandy part of the shore. As we walked along we picked up many shells of little sea-animals. We also saw a dead star-fish and a large number of jelly-fish."

The Fisherman.

(From the picture by H. S. Tuke in the Nottingham Art Gallery.)

36. SCOUTING BY THE SEA.—III.

1. "We next turned our attention to the waves. We found them very interesting. We could have spent the whole day watching them.

2. "Notice a field of wheat across which the wind is blowing. The ears of wheat bend down and rise up again as the wind passes over them. They do not move onwards, yet you seem to see a wave running over the wheat.

3. "A wave is an up-and-down movement passing across water. We can make waves for ourselves with a skipping rope. If one girl holds the handle firmly and the other girl shakes the rope, you will see waves running along it.

4. "Most children like to make waves by throwing a stone into a pond. If the water is still, the waves spread out in rings, which grow larger and larger until they touch the shore.

5. "If the pond is deep, the water of the waves simply rises and falls; it does not move onwards. We can prove this by launching a little paper boat on the pond and then making waves. When the waves reach the boat they simply move it up and down, and do not drive it onward.

6. "Nearer the shore, however, the waves, in rising

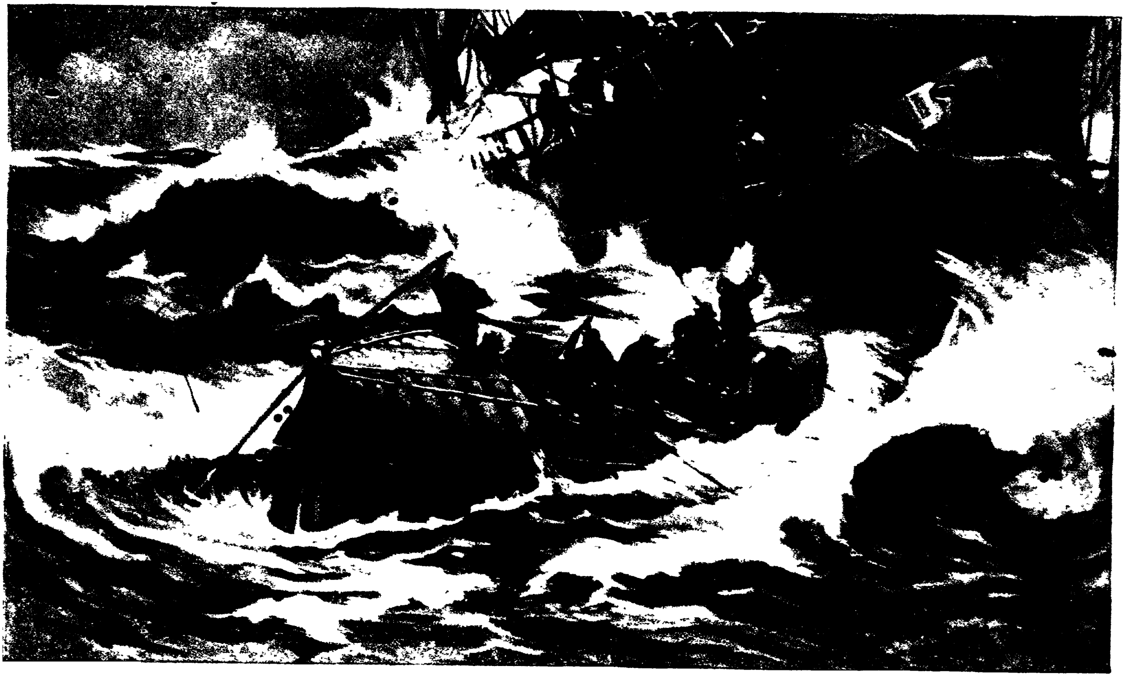
and falling, touch the bottom; then the up-and-down motion is changed into an onward motion. When the sea is rough and the wind is blowing on the land, the waves roll on to the beach like troops of horse soldiers charging the enemy.

7. "On some shores the waves or 'breakers' roll in with such force that landing from ships is very dangerous. The ships lie out in deep water, and the passengers have to go ashore in what are called 'surf-boats.' They ride in on the top of the great waves, and are carried high on to the beach. Instantly the boat is dragged out of reach of the next wave.

8. "In the South Sea Islands the boys and girls have great sport in 'riding the breakers.' Each boy and each girl has a short, flat board. With this they dive into the foam and strike out to sea.

9. "Then they turn and lie down flat on the board. The mighty rolling wave carries them, shouting with delight, towards the shore as fast as an express train. Just as the wave is about to fling itself on the beach, the children slide back into the trough behind, and, plunging under the next wave, swim out to sea to ride the breakers once more.

10. "It is easy to understand that the power of these 'breakers' must be very great indeed. So powerful



"Women and Children First!"

From the picture by T. M. Hemy. By permission of Messrs. Goupil.

are they that they can toss tons of rock to and fro like playthings.

11. "We must not suppose that the sea only does its work of planing down the shore during storms. Every time the tide rises, and every time it falls, a great deal of planing work is done.

12. "At Shell Bay we saw some old cliffs a long way above high-water mark. In front of them was a great deal of dry, loose sand. We could easily see that the water had not been up to these old cliffs for many long years. We could not understand why the sea had left them high and dry.

13. "Teacher showed us that the waves on this part of the coast have heaped up sandhills, and have thus built a barrier against themselves. In this way the old cliffs have been cut off from the sea."

37. SCOUTING BY THE SEA.—IV.

1. I think the boys and girls of the second scouting party had the pleasanter task. They had to find out how the people of Shell Bay earn their living. This is their report:—

2. "Nearly all the men and boys in the village of Shell Bay are fishermen. They live by reaping the harvest of the sea. There are no mines, quarries, or factories in the place.

3. "There are not many shops, and there is only one school. Several of the shops sell rope, twine, sou'-westers, oilskins, jerseys, and other things which fishermen need for themselves or their boats.

4. "The busiest part of Shell Bay is round the harbour. The shops are there, and so are the stores of the fish salesmen. On the wall round the harbour you can almost always see fishermen baiting their lines and mending their nets.

5. "Two long walls, something like horns, run out seaward from the harbour. At the end of each wall there is a small lighthouse showing a red light. By means of these lights the fishermen know the position of the harbour at night.

6. "At high tide the harbour is full of water, and looks like a lake. At low tide it is almost dry. The boats then rest on the sand.

7. "There are two kinds of fishing-boats in the harbour. The smaller kind are open boats, the larger kind are decked over, and have cabins in which the men can live.

8. "The small boats fish within a few miles of the shore. The larger boats make voyages to distant fishing-grounds, and are sometimes absent from Shell Bay for months at a time. The fishermen who sail in the open boats fish with lines; those who sail in the decked boats use nets.

9. "We saw a fisherman preparing his line; it was

very long indeed. Hanging from it, a few feet apart, were many short lines. At the end of each short line there was a hook.

10. "The fisherman was busy putting the flesh of mussels or limpets on the hooks. After he had baited a piece of the line he coiled it neatly in a basket.

11. "When all was ready the fisherman and his two mates kindly offered to take a boy and a girl with them in their boat. As it was a fine day, teacher said that two of us might go if we would promise to be very careful and not get in the way of the men."

12. We thought that the boy and the girl who were chosen to go fishing were very lucky indeed. Teacher said that they must be our eyes and ears, and tell us all that they had seen and heard.

38. A DAY'S FISHING.

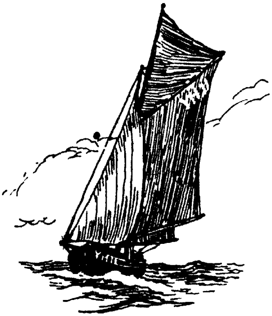
1. The girl and the boy who went in the fishermen's boat gave us the following report:—

"Our boat was called the *Good Intent.* It belonged to the three fishermen who asked us to go with them.

2. "As soon as we had taken our seats they rowed the boat out of the harbour, and then hoisted the

brown sails. There was a pleasant breeze, and the boat bounded gaily over the sparkling waters. In less than an hour we reached the fishing-ground.

3. "We asked one of the fishermen what he meant by a 'fishing-ground.' He said that it was a part of the sea where fish gather in great numbers. The little sea-animals on which the fish live abound in such places. The fish follow their food, and the fishermen follow the fish.



4. "How does a fisherman know when he has reached the fishing-ground? All the sea seems alike, and you would imagine that the fisherman could never find the same place again, except by accident. He does so, however, in the following simple way.

5. "When he first discovered the fishing-ground he 'took his bearings.' This means that he noted the position of certain marks on the shore.

6. "Looking to the left, he perhaps saw that one of the lighthouses at the harbour-mouth was exactly in line with the tower of the church on the hill. Looking to the right, he also noticed that the flagstaff in front of the coastguard's house was exactly in line with a windmill some miles inland. All that he has now to do in order to reach the same place again is to sail on until the 'land-marks' are in their former position.

7. "Having reached the fishing-ground, the men fastened one end of their long line to a little buoy, and threw it overboard. Then as the boat moved on they threw out the rest of their line. The end of it was fastened to another buoy.

8. "When this was done the boat sailed away for some mackerel-fishing. The men used hand-lines, and the only bait needed was a bright bit of mackerel skin. The mackerel is a cannibal, and he is always ready to devour his brethren.

9. "After an hour or so the men prepared to pick up the long line. The boat was sailed towards one of the buoys, and the mainsail was brought down. The buoy was taken on board, and one of the men hauled in the line, hand over hand. Another man stood by with a hook ready to 'gaff' the fish as they came alongside.

10. "Soon there was a broad, white gleam in the water, and we saw a skate rolling and splashing as it was hauled nearer and nearer. A quick stroke with the hook, and the fish was lying on the bottom of the boat. Another and another skate followed, and then came a fat haddock.

11. "A big conger eel was brought to the surface soon after, and was hit heavily on the head before

being thrown amongst the other fish. Next came a gurnet, then a whiting, then more gurnets and another whiting.

12. "Every now and then a big whelk was seen, but it usually dropped off the hook into the water as it reached the side of the boat. A fine starfish was given to us as a keepsake.

13. "At length the end of the line was reached, and the second buoy was picked up. Then sail was 'made,' and in about two hours the boat was running between the twin walls of the harbour.

14. "The 'catch' was spread out on the harbour wall by the side of the fish which other fishermen had caught. After a time a fish-salesman appeared, and sold the fish to the highest bidder. It was then packed in ice and hurried away by train to the shops of large towns."

39. MAN THE LIFEBOAT!

1. "While two of our companions went fishing, some of us went on board one of the decked boats in the harbour. The men on board were very kind, and told us all about their work.

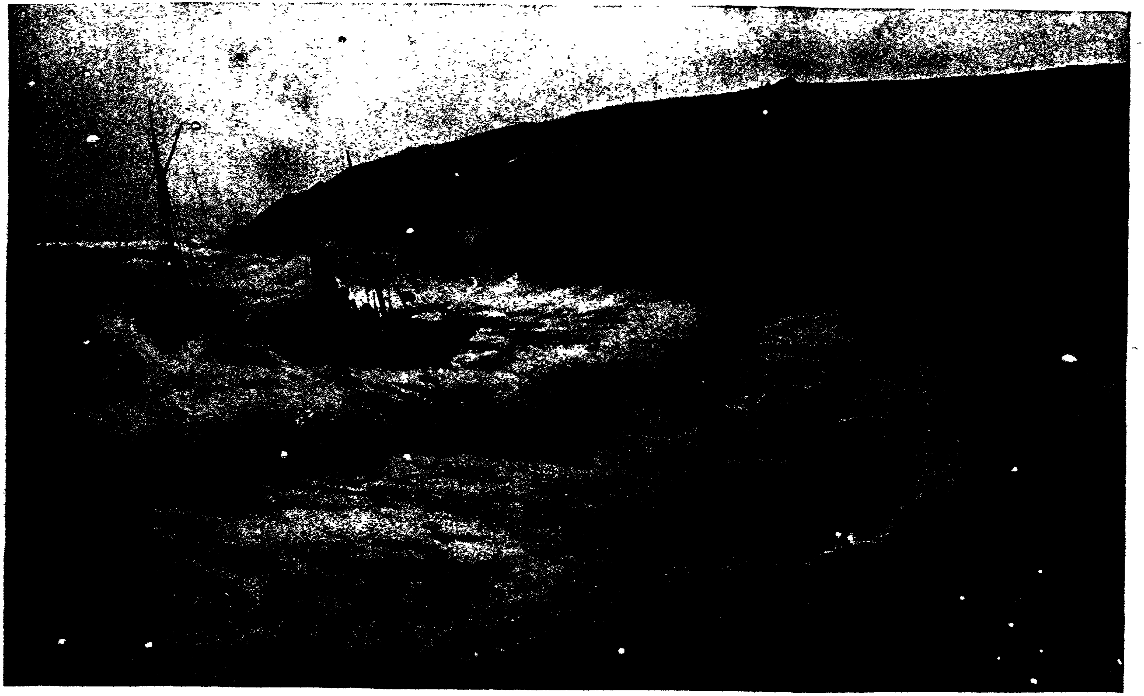
2. "They showed us their 'trawl,' which is a large bag-net with a wide mouth. It is dragged along the bottom of the 'fishing-grounds' by means of a long rope. After a time it is hoisted on board, and the fish

are emptied out on to the deck. We also saw the "drift" nets in which herring are caught.

3. "One of the fishermen told us that the day of the sailing trawler was over. He said that most of the trawling is now done by steamships. Through his telescope we saw one of these steam-trawlers far out at sea.

4. "On the wall of the harbour we saw a man carrying several lobster pots. They are traps made of wickerwork. The lobster swims in through the door, which is so made that it will not open outwards. Crabs are caught in much the same way.

5. "The fisherman lives a very hard and dangerous life. He is always at the mercy of the wind and the waves, so he needs to be warned against coming storms, and sometimes saved from the raging sea.

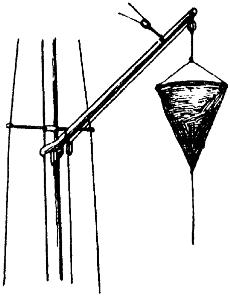


THE ROCKET.

(*From the picture by Edmund G. Fuller.*)

6. "On the harbour wall we saw a barometer and a thermometer inside a glass case. We noticed that every fisherman went to look at the 'glass' before going on board his boat.

7. "The coastguard told us how the fishermen are warned that a storm is coming. When a telegram comes from London saying that 'dirty weather' is expected, the coastguard hoists a cone made of wood and canvas.



8. "If the gale is expected from the north, the north-east, or the north-west, he hoists the cone with the point uppermost. If the gale is expected from the south, the south-east, or the south-west, he hoists the cone with the base uppermost. At night he shows a triangle of lamps in the same way.

9. "The coastguard took us to see the lifeboat, which is kept in a house close to the shore. We found that the lifeboat was placed on a carriage, so that it could be dragged down to the water's edge and launched without loss of time.

10. "The boat looked very big and strong, and the coastguard said that if it were overturned by the waves it would right itself at once. The bow and stern of the boat are like great buoys which keep it upright.

11. "We clambered into the boat, and noticed that there was plenty of room in it, not only for the rowers,

but for shipwrecked persons as well. Our guide told us that the boat in which we were then sitting had saved no less than fifty lives.

12. "Hung up on the walls of the house were a number of cork jackets. These are worn by the lifeboatmen when they put out to sea. If a man wearing a cork jacket is washed overboard, he will float until he is picked up. All round the outside of the boat are loops of rope to which drowning persons can cling.

13. "We also saw the rocket apparatus, which is used when a vessel is wrecked near the shore, and a lifeboat cannot reach it because of the rocks or shallow water. The coastguard showed us the rocket and the tube out of which it is fired. He also showed us the line carefully coiled up in a box, so that it can run out freely.

14. "The line is fastened to the rocket, which is fired so that it will fly right over the wrecked ship. If the rocket has been well aimed, the line falls on the wreck, and is eagerly seized by the men on board. They haul on the line, and find at the end of it a strong rope.

15. "At the end of this rope there is a very thick and much stronger rope. This is hauled on board and fastened to the mast. Thus a slender bridge is formed between the wreck and the land.

16. "A kind of life-buoy is slung on this rope, and is hauled to and fro. By means of this 'breeches buoy,' as it is called, the crew and passengers of the wrecked ship can be brought safely to land."

17. We returned home in the evening, after a long and very happy day by the sea. A fortnight later our midsummer holidays began. Before they came to an end Dick Smith and I were the proudest members of the Kangaroo Patrol.

18. We soon found that teacher was right, and that we were all the better scouts for our geography lessons. We already knew many things that scouts have to learn, and we had been taught to use our eyes and to reason about what we see. Dick and I both hope to be first-class scouts before very long.

Poetry for Recitation.

I. GREAT, WIDE, BEAUTIFUL, WONDERFUL WORLD.

1. Great, wide, beautiful, wonderful World,
With the wonderful water round you curled,
And the wonderful grass upon your breast—
World, you are wonderfully drest.

2. The wonderful air is over me,
And the wonderful wind is shaking the tree;
It walks on the water, and whirls the mills,
And talks to itself on the tops of the hills.

3. You friendly Earth, how far do you go,
With the wheat fields that nod and the rivers that flow,
With cities and gardens, and cliffs and isles,
And people upon you for thousands of miles?

4. Ah! you are so great and I am so small,
I tremble to think of you, World, at all;
And yet, when I said my prayers to-day,
A whisper inside me seemed to say,
"You are more than the Earth, though you
are such a dot;
You can love and think, and the earth
can not!"

W. B. RANDS.

2. THE RAIN, WIND, AND SNOW.

1. Rain! rain! April rain!
Bring the flowers back again;
Yellow cowslip and violet blue,
Buttercups and daisies too.
Rain! rain! April rain!
Bring the flowers back again.

2. Wind! wind! autumn wind!
He the leafless trees has thinned;
Loudly doth he roar and shout;
Bar the door and keep him out.
Wind! wind! autumn wind!
He the leafless trees has thinned.

3. Snow! snow! pure white snow!
O'er the fields thy covering strow;

Cover up the seed so warm,
Through the winter safe from ha[illegible]
Snow ! snow ! pure white snow !
O'er the fields thy covering strow

4. Rain, wind, snow—all three,
Each in turn, shall welcome be ;
Each and all in turn are sent
On the earth with good intent.
Rain, wind, snow—all three,
Each in turn, shall welcome be.

Rhyme and Reason.

3. DAYBREAK.

1. A wind came up out of the sea,
And said, " O mists, make room for me."

2. It hailed the ships, and cried, " Sail on,
Ye mariners, the night is gone."

3. And hurried landward far away,
Crying, " Awake ! it is the day."

4. It said unto the forest, " Shout !
Hang all your leafy banners out ! "

5. It touched the wood-bird's folded wing:
And said, "O bird, awake and sing."

6. And o'er the farms, "O chanticleer,
Your clarion blow; the day is near."

7. It whispered to the fields of corn,
"Bow down, and hail the coming morn."

8. It shouted through the belfry tower,—
"Awake, O bell! proclaim the hour."

9. It crossed the churchyard with a sigh,
And said, "Not yet! in quiet lie."

HENRY WADSWORTH LONGFELLOW.

4. JACK FROST.

1. The frost looked forth on a still, clear night,
And whispered, "Now I shall be out of sight;
So through the valley and over the height
In silence I'll take my way.
I will not go on like that blustering train,
The wind and the snow, the hail and the rain,
That make such a bustle and noise in vain;
But I'll be as busy as they!"

2. So he flew to the mountain, and powdered its crest;
He lit on the trees, and their boughs he dressed
With diamond and pearls; and over the breast
Of the quivering lake he spread
A coat of mail, that it need not fear
The glittering point of many a spear
Which he hung on its margin, far and near,
Where a rock could rear its head.

3. He went to the window of those who slept,
And over each pane like a fairy crept;
Wherever he breathed, wherever he stopped,
By the morning light were seen
Most beautiful things!—there were flowers and trees,
There were bevies of birds and swarms of bees;
There were cities, and temples, and towers, and these
All pictured in silvery sheen!

4. But he did one thing that was hardly fair:
He peeped in the cupboard, and finding there
That all had forgotten for him to prepare,
"Now just to set them a-thinking—
I'll bite this basket of fruit," said he,
"This costly pitcher I'll burst in three!
And the glass of water they've left for me
Shall *tchick* to tell them I'm drinking."

HANNAH FLAGG GOULD.

5. MARCH.

1. The cock is crowing,
The stream is flowing,
The small birds twitter,
The lake doth glitter,
The green field sleeps in the sun;
The oldest and youngest
Are at work with the strongest;
The cattle are grazing,
Their heads never raising;
There are forty feeding like one!

2. Like an army defeated
The snow hath retreated,
And now doth fare ill
On the top of the bare hill;
The ploughboy is whooping—anon—anon
There's joy on the mountains;
There's life in the fountains;
Small clouds are sailing,
Blue sky prevailing;
The rain is over and gone!

WORDSWORTH.

6. SONG OF THE BROOK.

1. I come from haunts of coot and hern
   I make a sudden sally,
And sparkle out among the fern,
   To bicker down a valley.

2. By thirty hills I hurry down,
   Or slip between the ridges;
By twenty thorps, a little town,
   And half a hundred bridges.

3. Till last by Philip's farm I flow
   To join the brimming river;
For men may come and men may go,
   But I go on for ever.

4. I chatter over stony ways,
   In little sharps and trebles;
I bubble into eddying bays,
   I babble on the pebbles.

5. With many a curve my banks I fret
   By many a field and fallow,
And many a fairy foreland set
   With willow-weed and mallow.

6. I chatter, chatter as I flow
To join the brimming river;
For men may come and men may go,
But I go on for ever.

7. I wind about, and in and out,
With here a blossom sailing,
And here and there a lusty trout,
And here and there a grayling,

8. And here and there a foamy flake
Upon me, as I travel
With many a silver waterbreak
Above the golden gravel;

9 And draw them all along, and flow
To join the brimming river;
For men may come and men may go,
But I go on for ever.

7. THE WATER MILL.

1. "Any grist for the mill?"
How merrily it goes!
Flap, flap, flap, flap,
While the water flows.

Round about and round about
  The heavy mill-stones grind,
And the dust flies all about the mill
  And makes the miller blind.

2. "Any grist for the mill?"
  The jolly farmer packs
His wagon with a heavy load
  Of very heavy sacks.
Noisily, oh, noisily,
  The mill-stones turn about;
You cannot make the miller hear
  Unless you scream and shout.

3. "Any grist for the mill?"
  The bakers come and go;
They bring their empty sacks to fill,
  And leave them down below.
The dusty miller and his men
  Fill all the sacks they bring,
And while they go about their work
  Right merrily they sing.

4. "Any grist for the mill?"
  How quickly it goes round
Splash, splash, splash, splash,
  With a whirring sound.

Farmers, bring your corn to-day;
And bakers, buy your flour;
Dusty millers, work away
While it is in your power.

5. "Any grist for the mill?"
Alas! it will not go;
The river, too, is standing still;
The ground is white with snow.
And when the frosty weather comes
And freezes up the streams,
The miller only hears the mill,
And grinds the corn in dreams.

"AUNT EFFIE."

8. A SONG OF COAL.

THE COAL-MINER.

1. Deep in the mine, where the glad sunshine
Sends never its cheering beam,
I crouch and work in the gloom and mirk,
And follow the coaly seam.
'Midst the dangers dread that around me
spread,
With an arm that never tires,
My pick I ply, while the day runs by,
To feed your roaring fires.

THE IRONMASTER.

2. I take my toll of your hard-won coal
For my greedy furnace high.
Hear the fierce blast roar as it melts the ore,
While the flames leap to the sky.
See! hour by hour its fiery power
Never slackens in fierce affray,
Till in hissing stream, with a ruddy gleam.
Good metal flows away.

THE RAILWAY ENGINE-DRIVER.

3. With your coal I feed my masterful steed
That bounds o'er the iron rail,
And roars with glee as the milestones flee
Behind its gleaming trail.
By day and night, like an arrow's flight,
Past town and hill and tower,
We dash along with a scream of song,
Full sixty miles an hour.

THE SHIP'S ENGINEER.

4. My steam I raise with the good red blaze
Of the coal you daily win;
And my engines throb with a mighty sob
As we thrash through the tempest's din.

Thus, thus we sail through the roaring gale
And the ocean's leaping spray,
With a pitch and roll, to our distant goal,
Full half the world away.

THE HOUSEWIFE.

5. I bake and boil with the goodly spoil
Of the dark and deadly mine,
And my meats I roast for the hungry host
That homeward troops to dine.
But when day is o'er, and we've barred the door
'Gainst the wind and the winter's snow,
Round the fire we sit, to chat and knit,
And bask in its merry glow.

EDWARD SHIRLEY.

* * *

9. THE SANDS O' DEE.

1. "O Mary, go and call the cattle home,
And call the cattle home,
And call the cattle home,
Across the sands o' Dee!"
The western wind was wild and dank with foam,
And all alone went she.

2. The creeping tide came up along the sand,
And o'er and o'er the sand,
And round and round the sand,
As far as eye could see;
The rolling mist came down and hid the land—
And never home came she.

3. "Oh, is it weed, or fish, or floating hair—
A tress of golden hair,
A drownèd maiden's hair,
Above the nets at sea?"
Was never salmon yet that shone so fair
Among the stakes on Dee.

4. They brought her in across the rolling foam,
The cruel, crawling foam,
The cruel, hungry foam,
To her grave beside the sea.
But still the boatmen hear her call the cattle home,
Across the sands o' Dee.

Charles Kingsley.

EXERCISES ON THE LESSONS.

(To be worked by the pupils, under the direction of the teacher.)

LESSON 1.

1. Think of some shop window that you pass every day on your way to school. Write out a list of the things which you remember seeing in it.

[*Take your list with you on your way home, and notice what things you have forgotten.*]

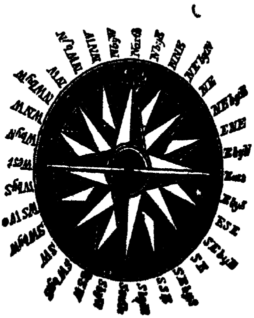
2. Look steadily at the frontispiece of this book for one minute; then close the book and write a short account of the picture.

3. What is the difference between the tracks made on a road by (*a*) a cart, (*b*) a motor car, (*c*) a bicycle?

4. Make a rough drawing showing the footprints of any bird.

LESSON 2.

1. Young sailors are taught to "box the compass"—that is, to name in order the thirty-two points. You can learn them too. They are as follows:—



NORTH.	N.	**SOUTH.**	S.
North by East	N. by E.	South by West	S. by W.
North-north-east	NNE.	South-south-west	SSW.
North-east by North	NE. by N.	South-west by South	SW. by S.
North-east	NE.	**South-west**	SW.
North-east by East	NE. by E.	South-west by West	SW. by W.
East-north-east	ENE.	West-south-west	WSW.
East by North	E. by N.	West by South	W. by S.
EAST.	E.	**WEST.**	W.
East by South	E. by S.	West by North	W. by N.
East-south-east	ESE.	West-north-west	WNW.
South-east by East	SE. by E.	North-west by West	NW. by W.
South-east	SE.	**North-west**	NW.
South-east by South	SE. by S.	North-west by North	NW. by N.
South-south-east	SSE.	North-north-west	NNW.
South by East	S. by E.	North by West	N. by W.

2. Make a compass card for yourself.

3. Suppose a piece of iron or steel is given to you. How can you tell whether it is a magnet or not?

LESSON 3.

1. With the help of your compass card draw a line from a point A to the north, and make the line two inches long. From the same point draw a line one and a half inches long to the west, and a line one inch long to the south-east.

2. If I walk one hundred yards to the north, one hundred yards to the east, one hundred yards to the south, and one hundred yards to the west, where am I?

3. Study the coloured picture on page 19, and answer the following questions:—

What time of day is it? How do you know? Point out north, south, east, and west on this picture. What kind of tree do you see by the pond? The pond is rather low now. What do you learn from this? In what work are most of the people in this village engaged? What machine do you see by the barn? For what is it used? What can you buy at the little shop?

LESSON 4.

1. Draw a line to stand for the height of Alice before she drank out of the bottle. Draw another line to show her height when she had shrunk to half her former size. Draw a third line to stand for her height when she had shrunk to one-quarter of her former size.

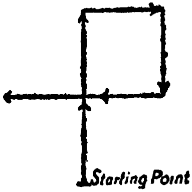
2. If a line an inch long stands for a minute's walk, draw a line to show *(a)* half a minute's walk; *(b)* two minutes' walk.

LESSON 5.

1. Describe the walk "plotted out" below.

2. In what direction or directions do you walk on the way home? With a watch notice how long you walk in each direction; then "plot out" your walk home.

N.B.—This exercise will probably take two or three days to complete.



LESSON 6.

1. Make a rough drawing to illustrate the "Hunt for Hidden Treasure."

2. Press an ink-bottle, a small cube, and a lead pencil on soft clay or plasticine, and note the shape of their plans. Draw these plans half the real size.

3. Copy the figure on page 23, and say how far the boys had to walk from A to find the first button; how far from B to find the second button; and how far from E to find the third button. Remember that they walk 80 yards minute.

LESSON 7.

1. From the plan on page 26 find out the length and breadth of the school building (inside measurement).

2. How wide is the corridor? (Measure to the nearest foot.) Find the length and breadth of the largest classroom. How wide are the windows? How wide is the staircase? Find out how many boys can walk abreast down the staircase.

3. Study the coloured picture on page 28, and answer the following questions:—

What is the girl doing? What is the old man doing? Describe him. What do you see lying on the table by the old sailor's left hand? Why does he need a map? To what country does he belong? How do you know?

4. Make a rough plan of "Our Village" as shown in the picture on page 19.

LESSON 8.

1. How far, as the crow flies, is Topham Mill from Patley Bridge?

2. If you can walk eighty yards a minute, how long will you take to walk from Patley Bridge to Barton Church? Suppose you start at ten minutes past five and service begins at six, how much late will you be?

3. Study the coloured picture on page 32. What mountains are shown in the picture? Point out the pass or road across the mountains. What has happened to the traveller? What will happen to him if he is not rescued? What large building do you see in the background? Who live in it? What kind of dogs are seen in the picture? Describe them. What are they doing? What will happen to the traveller?

LESSON 9.

1. Answer the questions given in paragraph 2 on page 34.

2. Work out the scouting problem given in paragraph 3 on page 34.

3. If I measure the length of a river with the cogged wheel, the result will not be quite correct. Will it be more or less than the real length of the river? Why?

LESSON 10.

1. Make an outline drawing, a little larger, of the flask and tube on page 38.

2. "Everybody is interested in the weather." Why are the farmer and the sailor very much interested in the weather?

3. Put a kettle nearly full of water on the fire, and it will boil over. Why?

LESSON 11.

1. Make a rough drawing of a thermometer.

2. On squared paper such as that shown on page 173 keep a record of the degrees of heat shown by the thermometer every day at 11 a.m.

[Teacher will tell you each day the degree of heat, and you will place a dot on the line which stands for that degree. When these dots are joined together by straight lines, they will form a figure which shows you how the heat of the air varies from day to day.]

LESSON 12.

1. Suppose you measure very carefully an iron rod on a hot summer day, and measure it again on a cold winter day. Will there be any difference in the length? If so, why?

2. When iron rails are laid down for a railway a little space is left between each length of rail. Why?

3. Describe the picture on page 46.

LESSON 13.

1. Describe how the air can be weighed.

2. What instrument do we use to measure the pressure of the atmosphere? Suppose I were to make a little hole at the top of the tube shown on page 50, what would happen?

3. A space with very little air in it is called a *vacuum*. Write out the word in your best writing three times. Where is there a vacuum in a barometer?

4. Describe the coloured picture on page 51.

LESSON 14.

1. Sometimes you hear a person say, "The glass is high." What does this mean?

2. Suppose you climb a mountain and carry a barometer with you. What do you notice about the barometer as you ascend and descend?

3. On squared paper such as that shown on page 174 keep a record of the pressure of the air.

[Teacher will tell you each day what the pressure is, and you will put a dot on the line which stands for it. When these dots are joined together by straight lines, they will form a figure which shows you how the pressure of the air varies from day to day.]

LESSON 15.

1. In what ways can you find out the direction of the wind?

2. Does the revolving cowl on a chimney always turn round the same way? If not, why not?

3. Make a wind-rose for a week.

[You will find directions for doing this on page 175.]

LESSON 16.

1. Make a drawing, a little larger, of the rain-gauge.

2. Describe the picture on page 60. Why is the place shown in the picture such a wet spot?

3. Why are the winds which blow across the British Isles from the west and south-west warm and wet?

4. On squared paper such as that on page 176 keep a record of the rainfall.

[Teacher will tell you each day what the rainfall is, and you will put a dot on the line which stands for it. When these dots are joined together by straight lines they will form a figure which shows you how the rainfall varies from day to day.]

LESSON 17.

1. What is the difference between a cloud, a mist, and a fog?

2. Describe the coloured picture on page 64.

3. How are the colours arranged in a rainbow? Which colour is on the inside of the bow?

4. Write out in your best handwriting the verse of poetry on page 67.

LESSON 18.

1. "The earth would be a desert if there was no rain." Describe a desert, and name the chief animals and plants to be seen on a desert.

2. If you had to cross a desert, what instrument could you use to guide you? How should you use it?

3. Explain why there cannot be rain without dust in the air.

LESSON 19.

1. Make a rough drawing of three of the ice crystals shown on page 71.

2. Describe the coloured picture on page 73.

3. Why does snow remain on high mountains all the year round?

4. Write a little story to illustrate paragraph 10 on page 72.

LESSON 20.

1. Describe the picture on page 74.

2. Of what use are glaciers?

3. Of what use is snow?

LESSON 21.

1. In what part of the sky does the sun *seem* to rise? In what part of the sky does it seem to set? Does it rise and set in the same parts of the sky all the year round?

2. How many times does the earth spin round on its axis in five years?

3. What is the most northerly place on the earth called? What is the most southerly place on the earth called?

4. Write out and learn the following:—

The equator is an imaginary line running round the earth midway between the poles.

What do you mean by *imaginary?*

LESSON 22.

1. Write out and learn:—

The axis of the earth is an imaginary line on which the earth spins round from west to east. The ends of the earth's axis are the poles.

2. "We travel more than one thousand miles an hour." How is it that we do not feel this very rapid motion?

3. If you travel half-way round the earth from England you come to New Zealand. What time is it in New Zealand when it is twelve o'clock in the day with us?

4. Why do we take an orange to represent the shape of the earth?

LESSON 23.

1. Describe the picture on page 86.
2. Describe how the quarrymen break down the rock in a quarry.
3. What use do we make of the stone got out of a quarry?
4. What do you mean by *bedded rocks?*

LESSON 24.

1. What are "nature's quarrymen"? How do they work?

2. Name all the kinds of rocks that you know.

3. Why do not good crops grow on the sides of high hills?

4. Describe the coloured picture on page 93. Name any of the flowers that you know. Why do flowers grow so well in this garden?

LESSON 25.

1. What do limestone or chalk rocks teach you about the part of the country where they are found?

2. Where are chalk rocks now being formed?

3. How has slate been formed?

LESSON 26.

1. Describe the coloured picture on page 96.

2. "When we sit by a coal fire we are warming ourselves with the sunshine of long ago." Explain this.

3. What do you find *above* the coal? What is underneath the coal?

4. Coal is sometimes called "black diamonds." Why?

LESSON 27.

1. Explain why coal-mining is dangerous work.

2. Why ought miners to notice the barometer?

3. Read the poem, "A Song of Coal," on page 156, and write ten lines on the uses of coal.

4. Find out where the coal which is used at your home comes from, and how it is brought from the pit to your house.

LESSON 28.

1. Write out and learn the following:—

A volcano is a hole in the earth out of which steam, ashes, mud, and molten rock (lava) are hurled. Volcanoes pile up for themselves hills shaped like a sugar-loaf with the point cut off. The hollow part at the top is called the "*crater.*" *The opening is called the* "*vent.*"

2. Copy the drawing on page 103. It shows you what a volcanic hill looks like when it is cut through and half of it is removed.

3. Write an account of the coloured picture on page 106.

4. How has limestone been formed?

LESSON 29.

1. Make a little drawing showing rain streams running down a road.

2. What do you learn from the picture on page 110?

3. Write out in your best writing the two verses of poetry on page 109.

LESSON 30.

1. Write an account of the picture on page 112.

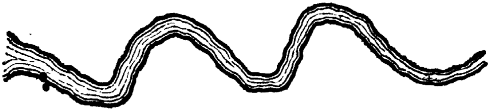
2. Copy in outline the drawing of a bridge over a stream. (See page 115.) Why is the bridge wider than the stream? Why is the arch a good deal higher than the level of the water?

3. How can you find out the speed at which a river is running? In which part of the stream does the water run most rapidly?

LESSON 31.

1. Describe the picture on page 116.

2. Here is a little drawing showing part of the course of a very winding river. Put a cross at the places where the bank is higher than the opposite bank.



3. Write out and learn the following :—

The "channel" or "bed" of a river is the hollow or groove which it wears away in the land.

A river has two "banks" or sides. As we sail on the river and look in the direction in which it is flowing, the bank on our right hand is the "right" bank, and the bank on our left hand is the "left" bank.

The joining-place of two streams is called a "confluence."

LESSON 32.

1. Copy the plan of the pond given on page 120.

2. Make a little drawing of the delta on page 122.

3. Write out and learn the following :—

When some slow-flowing rivers draw near the sea they divide up into a number of branches, and find their way to the sea by many mouths. The land between these mouths is called a "delta," because it is shaped somewhat like the Greek letter Δ (delta).

Sand-banks at the mouth of a river form "bars."

LESSON 33.

1. Describe the coloured picture on page 123.

2. Make a little diagram showing that there is about three times as much water as land on the surface of the earth.

3. With which—a hot brick or a bottle of hot water—would you warm a bed? Say why.

4. In what ways is the sea useful to man?

LESSON 34.

1. Turn to the frontispiece and describe the cliffs which you see in the picture. Why do the cliffs in the distance seem lower than those near at hand?

2. Why do sea-birds make their nests high on cliffs? Describe the scene pictured in the frontispiece.

3. Explain how the heap of rubbish at the foot of a cliff has been formed.

LESSON 35.

1. Describe the rock pool shown on page 130.

2. Write all you know about seaweeds.

3. Why are the bigger pebbles found higher up the beach than the smaller ones?

4. Why are the pebbles on the beach smooth and rounded?

LESSON 36.

1. What are breakers? How are they formed?

2. Describe how the children of the South Sea Islands "ride the breakers."

3. Sometimes we see old cliffs a long way above high-water mark. How have they been left high and dry?

LESSON 37.

1. Make a rough sketch of the harbour at Shell Bay.

2. What kinds of fishing-boats have you seen or heard of?

3. If you have ever fished in a pond or a stream, write an account of your fishing.

4. Write down the names of all the fresh-water fish that you know.

LESSON 38.

1. How does a fisherman know when he is on his "fishing-ground"?

2. What do we mean by the "harvest of the sea"? Write down the names of all the salt-water fish that you know.

3. Describe the coloured picture on page 136.

LESSON 39.

1. Describe a trawl. How is it used?

2. Make a drawing of the cone which is hoisted when a gale from the south-east is expected.

3. Describe the picture on page 144. How are shipwrecked persons rescued by means of the rocket apparatus?

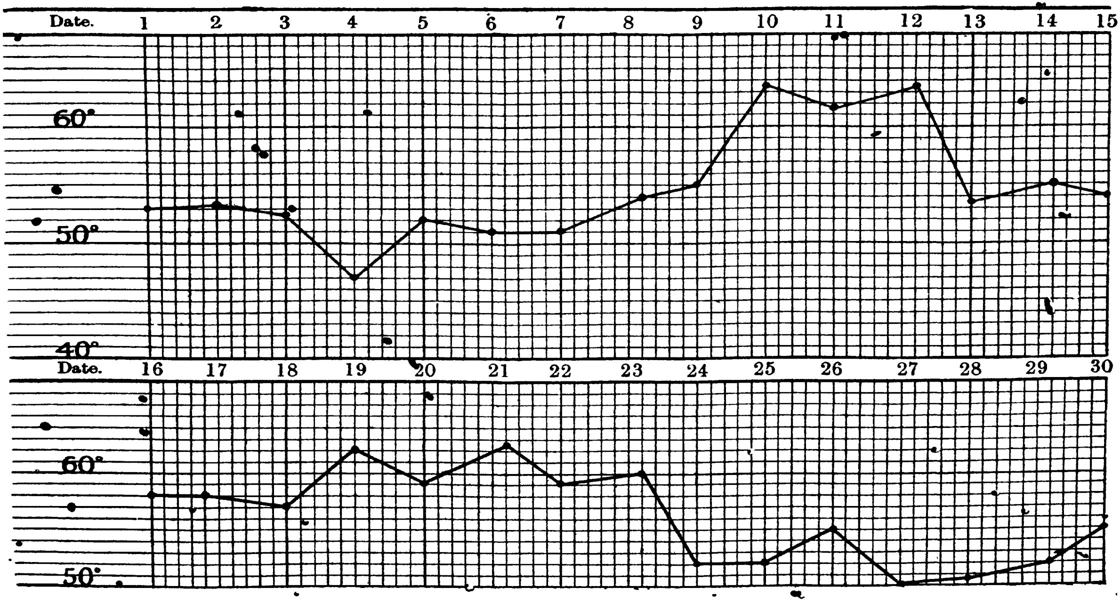
RECORDS TO BE KEPT BY THE CHILDREN.

RECORDS TO BE KEPT BY THE CHILDREN.

1. Temperature.

Each morning the teacher will read the thermometer and tell the class the degree of heat. A dot will be placed on the line showing this degree. When these dots are joined together by straight lines they will form a figure which shows how the temperature varies from day to day.

SPECIMEN RECORD FOR JUNE 1910.

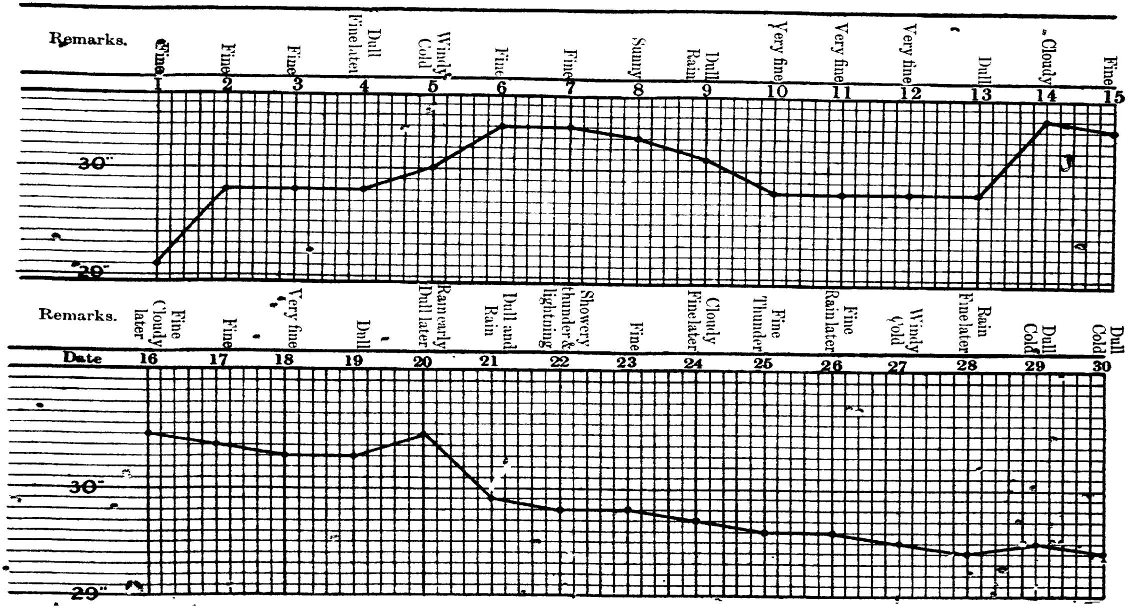


RECORDS TO BE KEPT BY THE CHILDREN.

2. Pressure of the Air.

Each morning the teacher will read the barometer and tell the class the height at which it stands. A dot will be placed on the line showing this height. When these dots are joined together by straight lines they will form a figure which shows how the pressure of the air varies from day to day.

Specimen Record for June 1910.



RECORDS TO BE KEPT BY THE CHILDREN.

3. Wind.

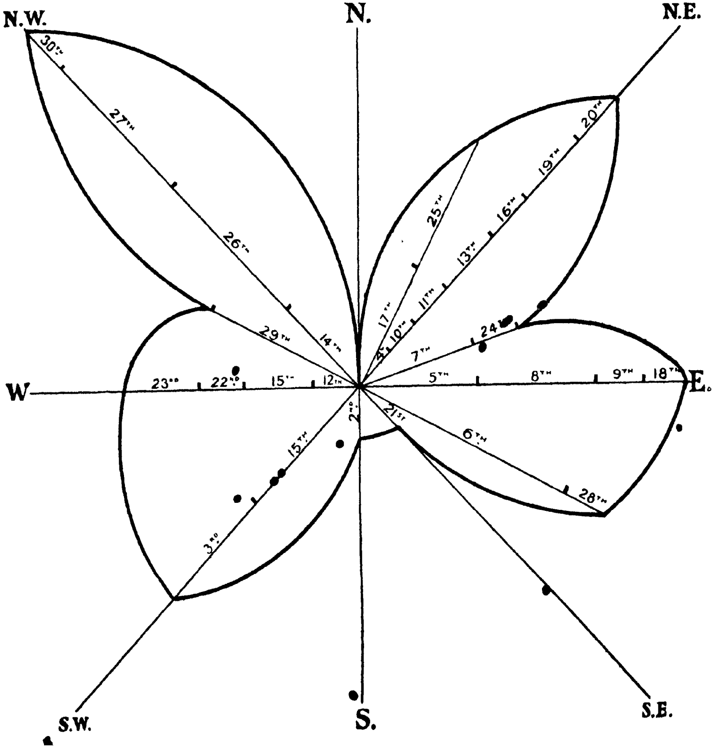
To make a *wind-rose*, take a point in the middle of the page and from it draw faint lines to the eight chief points of the compass. Find out each morning the direction of the wind, and draw a line in that direction. The length of this line will depend on the force of the wind, and this you must guess by watching a revolving chimney-cowl or the waving of the branches of trees. Use the following scale:—

Calm, ¼″ to ½″; light breeze, ¾″; strong breeze, 1″; gale, 1½″.

If the wind blows more than one day in the same direction, add the measurements for the second and following days to that of first day, thus—

|——1st——|——2nd——|——3rd——|

At the end of the month make a figure by drawing curves to join the ends of the wind lines.



RECORDS TO BE KEPT BY THE CHILDREN.

4. Rainfall.

Each morning the teacher will measure the water in the rain-gauge, and tell the children the rainfall for the past twenty-four hours. A dot will be placed on the line showing the amount. When these dots are joined together by straight lines they will form a figure which shows how the rainfall varies from day to day.

SPECIMEN RECORD FOR JUNE 1910.